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COMMERCIAL POULTRY FARMING

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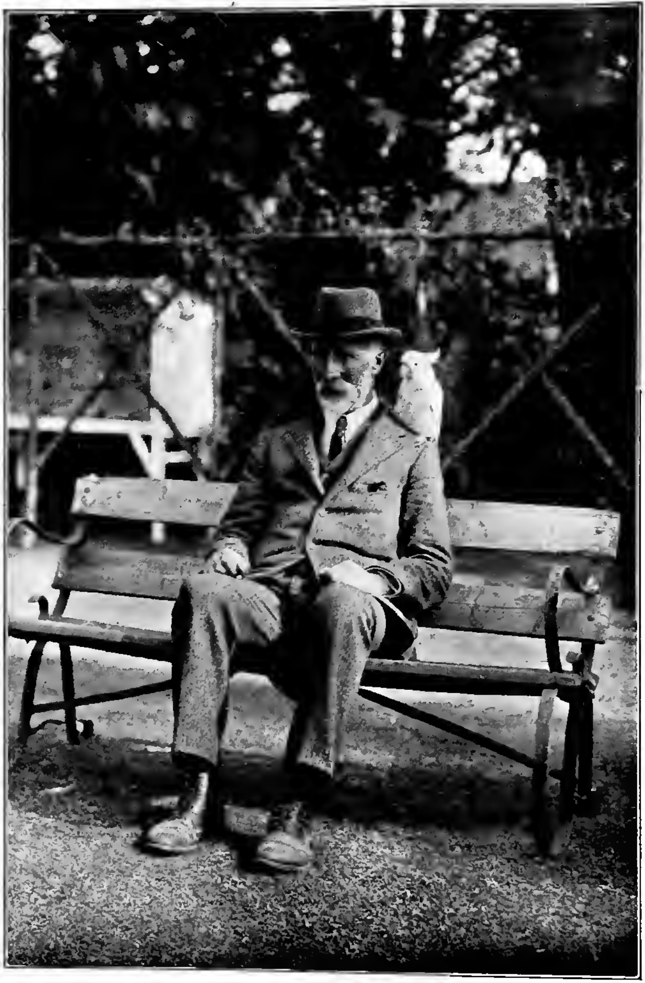
COMMERCIAL POULTRY FARMING



THE AUTHOR.

Frontispiece.

COMMERCIAL POULTRY FARMING

A DESCRIPTION OF THE KING'S LANGLEY POULTRY FARM AND ITS MODUS OPERANDI

[illegible]

BY

T. W. TOOVEY

Vice-Chairman of the Poultry Advisory Committee to the
Ministry of Agriculture, Member of the National
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Photographs by F. J. S. Chatterton

SECOND EDITION. ENTIRELY RE-WRITTEN

Capio Lumen

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INTRODUCTION

THREE years have passed since the first edition of *Commercial Poultry Farming* appeared.

The main principles of the system at work on the King's Langley Poultry Farm remain unaltered; further experience in working these has only tended to confirm their practicability and suitability for the purpose for which they were elaborated.

When the first edition was written, the system was comparatively young; during the three years in question I have, in the light of further experience, been able to still further consolidate matters and develop improvements in details which I think are valuable. I have therefore decided to rewrite the second edition throughout and furnish a fresh set of photographs to assist in elucidating the written description.

As a financial success the farm has greatly exceeded my anticipations.

T. W. TOOVEY.

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COMMERCIAL POULTRY FARMING

CHAPTER I

A GENERAL DESCRIPTION OF THE FARM

THE larger proportion of the poultry farms in this country depend mainly on eggs for setting, day-old chickens and stock birds for their returns; they are, in fact, breeders' farms. I am inclined to think this phase of the industry is being overdone. It is also true that in the past this farm did a very large setting-egg trade, and a smaller one in the other branches mentioned. One by one they were discarded; first, with the continual growth of the undertaking it was found impossible to spare pullets for sale, the day-old chick trade was dropped, and lately it has been decided not to cater even for setting eggs. There is no doubt that economically it is better to keep the businesses of a breeder and of what may be called a food producer separate; the one clashes with the other, and it is impossible to carry on the mixed businesses to the best advantage for each. I anticipate, too, there will be a considerable decrease in the demand for eggs for setting, as pure-breeds are now procurable in every town and village. This is the age of specialization, and it is not easy to specialize on plants containing several thousand head of stock, and where trap-nesting cannot be practised in the production of stock that can compete with that of the specialist breeder. There are other disadvantages which it is hardly worth going into now, except to say that the profits on the sale of setting eggs at moderate prices are very much less than might be thought, when all the concomitant expenses have been allowed for. Dealing now with the subject of this chapter, I will proceed with the general description. The farm has increased year by year beyond what at one time was thought desirable on the space available; there are now 6,000 head of laying hens, besides 200 Runner ducks. By dropping the setting-egg trade, a considerable saving is effected in limiting the cockerels to the number required for the farm's breeding-pens. It was a heavy expense, yearly, to provide the cockerels necessary for mating all the pens; their places in the laying houses are now occupied by layers, and more room is given for housing pullets. First-crosses will be largely bred, as they are in my opinion more profitable for the commercial poultry farmer, being easier to rear, more fecund on the average, and more profitable for the dual purpose of egg production and table qualities. One of the most important of the developments has been to strictly divide the laying plant from the rearing plant, placing each under its own staff, with a clear line of demarcation between. This involved considerable alterations to the "lay-out," even to the pulling down and re-erection of several of the large houses. The general improvement that has taken place in the results is well worth the trouble and expense incurred.

The 6,000 head of laying hens are housed in 37 houses in one field of 20 acres, the flocks running between 160 and 170 head. The semi-intensive system is the one in use. Six houses fenced off from the rest by a

6-ft. fence, each with its own double yards, formed with 6-ft. fencing, are set on one side for breeding purposes. Three houses contain pure-breeds, and are mated for breeding pure-breeds, the breeds selected being White Leghorns, White Wyandottes and Rhode Island Reds; 160 hens or very early hatched pullets in each house are mated to 10 cocks, half of which at least are very early hatched cockerels.

Three houses are mated for breeding first-crosses: (1) White Wyandotte cocks to Rhode Island Red hens; (2) White Leghorn cocks to White Wyandotte, Rhode Island Red, Buff Orpington and Light Sussex hens; (3) Houdan cocks to White Leghorn hens. No incubators or heated brooders are employed; the whole of the hatching and rearing is done by hens. The first hens are set on the Friday nearest to the middle of December, the last at the end of April or in the first week in May. This is arranged with the view of keeping the rearing staff regularly employed and to provide drafts of pullets for the laying houses for some nine months out of the twelve. The plant for the chicken rearing consists of 160 nests for broody hens, 144 coops, 60 cold brooders, 18 large houses, three of which are especially designed for dealing with young chickens from the brooders. The total number of large houses is now 57—37 for laying hens, 2 for laying ducks, and 18 for growing stock. With the exception of the duck houses they are of one type; no small houses of any kind are now in use. The intention is to give the maximum amount of land and plant to the layers, which are the profit makers, and to limit the plant and land for chickens to the minimum necessary to provide the necessary replacements for the laying houses. Table eggs are the primary source of income, and without any doubt will remain so, but table cockerels are an important factor in the general economy of the farm, and are likely to be more so. All new construction and repairs are done on the farm by the permanent carpenter.

The total staff consists of ten, including the carpenter. Four poultrymen have charge of the 6,000 laying hens. Two poultrymen and a lad hatch and rear the chickens and take charge of the growing stock until, in the case of the pullets, they are drafted to the laying houses, and of the cockerels, with the exception of the few required for breeding, until they are sold as table chickens. One man is in charge of the land cultivated for growing vegetables for all the livestock; he also looks after the flock of adult ducks, the four or five breeding sows and the young pigs. A girl storekeeper has charge of the eggs as they are delivered to the egg-room, and is responsible for the sale and delivery of eggs and chickens. Two horses form part of the equipment.

The area of the farm is 35 acres: 20 acres are occupied by the laying hens, 4 are under cultivation. Six cottages and their gardens occupy an acre; in these the married members of the staff live. The ducks have about an acre and a half of land and water, part of their range, and some poultry runs are also ranged by the pigs. The remainder of the land, with the exception of that covered by farm buildings, is reserved for the young stock.

The farm is situated on the lower slope of a valley, and is bordered on its lowest side by a canalized river. With the exception of the rich alluvial land in the bottom, which is mainly under cultivation, the soil is a light loam over gravel and chalk, and therefore is of the best kind for the purpose.

CHAPTER II

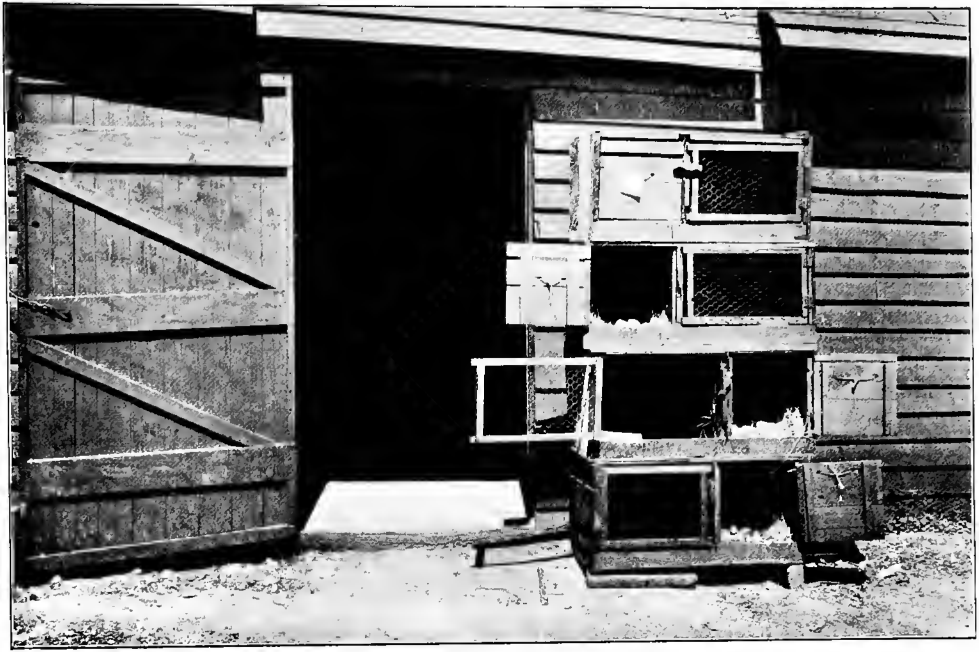
THE HATCHING PLANT

As a bad hatching and rearing season would be so fatal to the prosperity of the farm, the safest and surest means for obtaining the yearly replacements in the laying stock are secured by adopting natural methods. I think they are the cheapest also. When I hear of, as I do, the disasters that happen to those who depend, as is usually the case, on artificial methods, I congratulate myself that I discarded incubators and brooders long ago. The plant used for hatching and rearing is the result of many years' experimental work; we did not arrive where we are now all at once, by a long way. As we do not scrap our hens in the usual orthodox manner, that is, at the end of their second season of laying, but keep them as long as their appearance indicates they are profitable, it is most desirable to spread the hatching and rearing of chickens over as long a period as nature will allow, in order to obtain drafts of pullets through as long a period in the year as possible. By doing this we are also enabled to restrict the amount of land and appliances allotted to chickens. The staff on this work can take their work comfortably, and therefore do it better than if they were being pressed to compass it all in the short season usually allowed, and can be more limited in numbers. In short, a long hatching and rearing season reduces the cost of the department. I have often noticed that the users of artificial methods are very shy of beginning operations early in the year, and appear to prefer to confine their labours to March and April.

There is no doubt at all in my mind that the only way to rear early chickens is to rear out in the open, under hens. It is natural to think that in the early months rearing should be practised under cover, and it took several disastrous failures to convince me that, as far as I was concerned, I could not rear, and could not show anyone else how to rear, under cover in January and February.

The secret of obtaining early sitters is to hatch early; there are always enough broodies here to meet our requirements. We commence setting hens on the Friday nearest to the middle of December, so that the first chickens are out early in January. There are 160 nests; 10 of these are kept for reserve hens, leaving 150 for actual work. As to hatch one brood occupies a nest a month, allowing for testing the hens, etc., we set one-fourth of the nests, viz. 40, each week until the whole are in operation. This goes on right through the season, so that a regular number of chickens hatch off each week, a regular number passing week by week through the various stages, and later on a regular number of table cockerels passing to market weekly. The hens are set in appliances of which an illustration is given; the set of four nests has been moved out of the hatching house for the purpose. The total length of both the nest and the airing chamber is 3 ft. 3 in., 15 in. being taken by the nest, and 2 ft. for the airing and feeding chamber; the depth of the appliance is 17 in. and they are 16 in. high. These appliances are stacked four-high down both sides of a long building 10 ft. wide; at each end there is a large glass window, and electric lights are

PLATE I.



BLOCK OF NESTS FOR SITTING HENS OUTSIDE THE HATCHING HOUSE.

To face p. 6.

suspended from the ceiling. The nests are made of hay and rest on the boarded floors; no earth or turf is used, as is so often, and wrongly, I think, recommended.

The hens are collected from the laying houses on Friday; they are then tested on dummies until Monday, and if they prove satisfactory are given 15 eggs; this is the best average setting for all hens and the one from which we have obtained the best results. The nesting appliances have two doors, which fold together and are secured by one button; there is also another small door between the two compartments. Each morning the hens are lifted from their nests and placed in the feeding chamber, which is littered with ashes. In the chamber there is a small square box for maize and a cast-iron round pan for water; if, however, any hen shows unwillingness to eat maize she is tried with wheat; as a rule they prefer maize. A hen when sitting does not consume more than half the normal amount. Whole round maize has proved for sitting hens a safer and more suitable food than flat maize or cracked maize of any kind. After the hen has been removed from the nest, it is examined for breakages or for any other irregularity; if all is well the door of the nest proper is closed. After an interval, which may vary from ten minutes in very cold weather to half an hour in warm, the small door between the compartment is opened and the hen walks back to her eggs; if after being well nested she shows any unwillingness to return, it is better to take her away and replace with one of the hens held in reserve. The eggs are tested on the eighth day with an electric-light tester; the clear eggs are of value to confectioners, or they can be used for chickens—raw, of course—in the soft food. If there are only a few clears, and this is generally the case, the settings remain;

if there are many clears the fertile eggs are gathered together and the spare hens are given fresh settings. As the chickens hatch, they are collected from the hens as fast as they are dry, and are placed in lots of 40 to 50 in fireless brooders, where they remain till from thirty-six to forty-eight hours old. It is very important this should be done, for as hatching proceeds hens are very likely to crush some of the brood in the confined space of a nest box. Chickens are rarely injured by being crushed by hens after they have got strong on their legs and are with them in the coop. The quietest hens are selected as mothers, and when the chickens have reached the age mentioned, they are taken to the rearing ground. A crate containing 14 hens and four of the brooder boxes containing 210 chickens can be placed on a barrow, and can go all together; by keeping the chickens in the fireless brooders until the coops are reached, all risk of chill on the journey is precluded.

The fireless brooders are boxes 1 ft. 6 in. square, 9 in. deep. A bottomless drum made of metal drops in the box, this being just under 1 ft. 6 in. in diameter and 8 in. deep. The ventilation is ingenious and is the speciality of the brooder. The round drum of course leaves the corners of the box empty. A round hole is cut in the side of the box at each corner, four in all. The hole is 2 in. in diameter; it is covered with perforated zinc; the perforations are large enough to take a 1½-in. wire nail easily. Round holes 4 in. in diameter are cut in the metal drum to correspond with the holes cut in the box. These have perforated zinc also soldered over them, and the perforations are finer; they will just take a pin. The wooden lid has a 6-in. square hole in the centre; this is covered with perforated zinc as for the corners of the box. Inside the drum a nest is made of hay, which lines the whole of the inside of the drum. A ring of stout wire fits in the drum and rests on the hay; this ring is covered loosely with muslin, a round eider-down quilt about ½ in. thick rests on the muslin. The brooder is warmed by conserving the chickens' own heat. Not less than 25 chickens should be placed at once in the nest; up to 50 or even 60 can be put in, but the thickness of the sides of the hay nest must be apportioned according to the number of the chickens put in. The brooders answer admirably for the purpose for which they are used here. These appliances were introduced into this country by Mr. Randolph Meech, late of Poole. I used them for one or two seasons for rearing completely, but for this purpose they required an immense amount of attention, as the chickens required putting in them and letting out all day long, there being no direct heat to attract the chickens when cold to enter them. When used as complete brooders they had a small doorway and were lighted by a window at the back, opposite the door; but, as I said, they were not a success as complete rearers. Very probably Mr. Sydenham Hannaford, of Hamworthy Junction, Dorset, as he was Mr. Meech's manager, could supply these very useful adjuncts to a hen-hatching plant.

The hatching plant's capacity in practice is about 2,000 eggs, and we get about a 70 per cent. yield of chickens from the eggs laid down. The advantage of natural hatching is that you can count the chickens before they are hatched; you can also depend upon rearing a regular percentage of chickens—always, of course, provided the stock birds are good and are properly fed, housed and yarded.

We set 10,000 eggs each season. We hatch about

70 per cent., and rear about 80 per cent. to maturity of the chickens hatched; we can depend upon doing this with mechanical regularity. Two attendants can attend to the hatching plant and hens in two hours daily, and beyond a look round just before leaving work, there is no more anxiety about the matter.

A set of cages with boarded bottoms, in which the hens not required as rearers are placed, completes the plant. Here they are fed up for a few days in order that they may recover their strength before they are returned to the laying houses. These cages have boarded floors, as barred bottoms have been found too cold for birds released from the warm nesting compartments. As the some 300 hens required for hatching and rearing are withdrawn from the laying houses, the last of the pullets of the previous year's hatching are drafted in to take their places, thus keeping the laying plant filled to its full capacity.

The nesting house and all the appliances are thoroughly cleaned and disinfected some weeks before hatching commences. It is advisable to have this work done in good time, so that the fumes from the disinfectants should disperse before eggs are set. I have reason to think that hatching eggs should not be brought in contact with strong disinfectants, the latter probably having an adverse effect on the germs.

CHAPTER III

REARING THE CHICKENS

THE failure to raise the necessary number of replacements in the shape of pullets has been one of the chief causes of loss on commercial poultry farms, and there is also the possibility that even when they have been reared they are obtained at too high a cost—a cost which has seriously militated against the general prosperity. It may be accepted that it is a good deal easier to hatch chickens than it is to rear them, especially when the numbers are large. Still, it can be done quite well without any undue anxiety or effort. I must confess it is with a mixture of sympathy and surprise I hear from my friends that they have found it necessary to have their complex and expensive plants visited throughout the night, at fixed intervals, in order to prevent disaster falling on the hundreds of chickens contained, perhaps, in one compartment. I have been told that so great is the strain that the operator does not by any means look forward to the rearing season and is very glad of a rest after it is over.

Season after season the Poultry Press is filled with conflicting views as to the best means of avoiding the pitfalls that seem so numerous in artificial methods, and much progress does not seem to be made.

With natural methods we can on this farm take the hatching and rearing season with equanimity, expecting that if the simple systems about to be described for rearing the chickens are carried out with reasonable care, success is as assured in rearing as in the hatching methods already described.

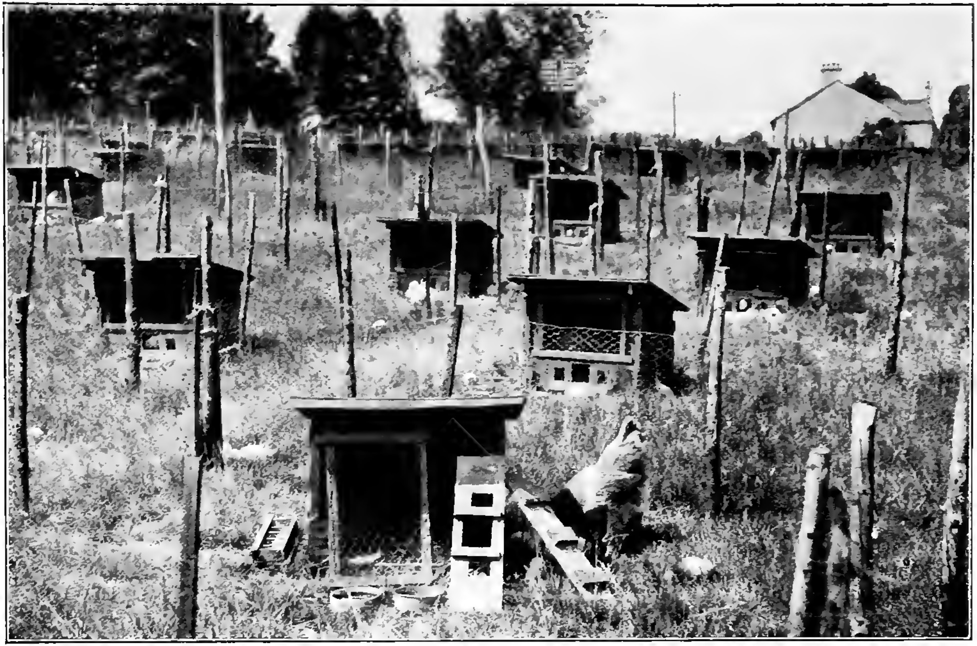
For a large day-old chick trade, hen-hatching would not be expeditious enough, but for simply maintaining the stock of a commercial farm it is amply so.

There is also the probability that chickens hatched by hens and reared in the open are stronger than those brought up under artificial conditions. They do not seem at any rate to be so subject to the more or less obscure diseases which, we read, appear to be so common amongst chickens under different circumstances.

The plant for taking the chickens for the first month or five weeks consists of 144 coops, each standing in its own pen or run. The idea is to have the whole chicken plant balanced, so to speak. To have both the capacity of the hatching arrangements, the capacity of the coops, the cold brooders, the housing for growing stock, all so to fit in with each other that there is no waiting, no overcrowding, and that one part is working harmoniously with the other. As the chickens arrive at the age of five weeks they are moved on to the cold brooders, other broods immediately taking their places in the coops. At the age of eight or nine weeks they pass to the chicken houses, where they learn to perch. At about three months old they go to the houses for growing stock; here they remain till the cockerels are sold for table or are sent to the fattening cages, with the exception of a few of the most promising, which are taken to an isolated house with a view of keeping them for stock. The pullets remain in the houses until they are required in the laying houses.

It is my desire now to describe the plant in detail. The coops, as the photograph shows, are not of the

PLATE II.



THE COOPS AND A PORTION OF THE REARING GROUND.

These have had a weather board sloping to the front and attached to the projecting front eave fixed to prevent driving rain entering the coop.

To face p. 12.

ordinary type; they are really miniature poultry houses with open fronts, except for the 6-in. skirting board. The outside dimensions are: width of front 2 ft., depth 1 ft. 8 in., height in front 1 ft. 9 in., at back 1 ft. 1 in. The floors are boarded and slightly raised from the ground; the fronts are removable completely, as shown.

Two improvements have been made lately: the coop is closed at night by a board slide, the duplicate of the skirting board, without the openings, and for feeding a narrow drawer slides in for nearly the whole length of one side, resting on the floor of the coop. This drawer, or feeding trough, is only 2½ in. wide, and 1½ in. deep and about 14 in. long; across the trough are four bars made of stout 4-in. nails, which prevent the hen or chickens scratching out the feed. The openings in the skirting board are three; the centre one is 3½ in. square and the small ones 2½ in. by 2 in.; through the larger one the hen can drink. The skirting board proper drops into grooves and rests on the floor of the coop; the board that closes the opening also drops into grooves placed in front of the first; the grooves are formed of ¾-in. strips of wood and sheet-iron strips. The top shutter, wire-netted, is held in place at the bottom by lugs dropping within the skirting board and at top by a button. By turning the button the whole front can be removed in a second. Natural rearing involves small units in great numbers, and everything must be done that can be done to facilitate speed in dealing with each. The alteration of the new closing shutter means the removal of 144 buttons, each of which had to be turned twice a day; the institution of the drawer has greatly contributed towards speed in feeding.

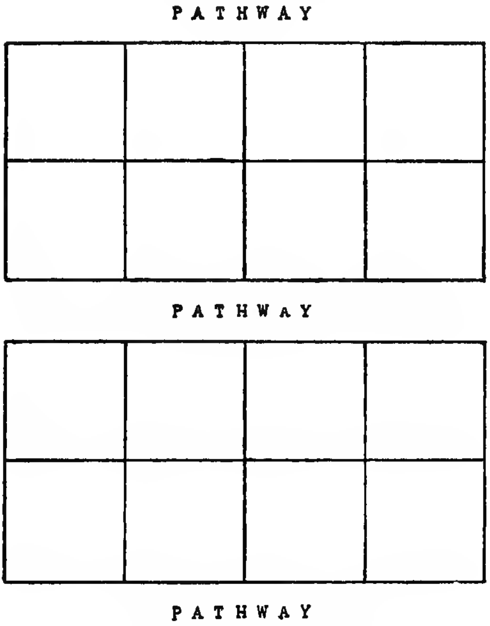
Another characteristic of the coop is the wide eaves, the front one projecting 6 in. to stop rain beating through the front and the others 2 in. all round. The wire front is exposed night and day; it is a great mistake to close the fronts of coops with shutters—I found this out many years ago. The material out of which the coop is made is as follows: feather-edge boards for sides and back, 2 × $\frac{3}{4}$ batten for the framing, and $\frac{1}{2}$ in. plain boards for floor and roof. In the case of the roof, the boards are covered with best felt, which is secured by plasterers' laths and 1 in. wire nails; no tacks should be driven directly through any felt used for roofing—they are sure to set up leaks in the long run. Strap the felt as it were in its place by laths, which should follow the fall of the roof.

The outside is dressed every two years with a coat of tar, and the inside of the coop with water-gas oil, which is similar in its appearance and effects with many of the wood preservatives sold under various names. It is as well to have this work done as soon as the breeding season is over; the fumes then have plenty of time to pass off.

Dry engine ashes for the coops are the best litter I know, and dry earth comes next; if I could get neither I should try sawdust, but should be afraid that the very young chickens might pick it up.

The old plan of setting coops at intervals about a field has long been given up; it meant too much labour; too many chickens were killed through getting in the wrong coops; the flocks, being so scattered, were greatly exposed to the attacks of vermin, and the losses were often heavy; it also required more space than I could spare. Each coop is put in its own pen or run, which is 10 ft. square. The following diagram explains the principle.

The coops are set next the paths and the attention is done, generally speaking, without getting into the runs. The drawers for feeding are next the paths, as some of the coops are fitted with the feeding drawer on the right-hand side and some on the left. The wire-netting of 1 in. mesh and 2 ft. high forming the runs is cut in 10 ft., 20 ft. and 30 ft. lengths, the 10 ft. lengths forming the divisions; the whole plant is set out each December, and at the end of the season is taken up and stored away on a long platform made of rough poles. The lengths of netting are permanently secured to short stakes, the points of which project 4 in. beyond the netting; these are tapped into the ground. The



PLAN OF RUNS FOR 16 COOPS.

pens are made rigid by lashing the upper portion of the stakes together at the corners ; the stakes, of course, are set at equal distances apart. It is very desirable for the pens to be kept at least 10 or 12 ft. from hedges and for the grass to be mown close between, as a safeguard against vermin, which generally object to cross open spaces. The whole blocks or streets of pens are surrounded by a ring fence as an extra precaution. The land reserved for the coops is the highest and driest on the farm; no signs of gapes have ever been seen. As three broods of chickens are passed through each coop and pen during the season, over 6,000 chickens are dealt with. The coops with the paths occupy about half an acre ; this is somewhat intensive, but as one and a half acres are reserved solely for the purpose, the land is only used once in three years. In the intervals it is grazed by the farm horses. The land to be used in the coming season is previously dressed with basic slag, at the rate of 1 ton to the acre, about October. The main principle of the whole thing is that the chickens have every inducement to get out in the open air and to be in direct contact with the land. However, until they are a week old we find it necessary to put a short piece of wire-netting down to confine them to a small piece of land in front of the coop, otherwise they get behind the coop and lose themselves, and thereby get chilled. If there is a fall of snow it is simply shovelled on one side and a space cleared for the chickens to run about on.

The system of feeding is to use both dry feed, in the shape of grain, and soft food. I feel quite convinced that a simple form of feeding is better than a complex one ; that most chick dry feeds contain seeds, often of an expensive character, that are better left out. I never use now any seed that has a hard, fibrous shell, such as canary seed and hemp.

Observation will prove that chickens do not care for these seeds, and leave them to the last, and if supplied with sufficient broken wheat and coarse oatmeal do not eat them at all. I have reared lately on a very simple and inexpensive dry chick feed, composed of three parts broken or kibbled English wheat of good quality to two parts of pinhead oatmeal and one part kibbled flaked maize; for the latter I intend to substitute maize grits made from white South African mealie maize next season. Two broods hatched by hens who set themselves late, and were left to wander about by themselves in the laying field, were mainly brought up on wheat screenings and kibbled maize, which was thrown to them when the feeder went round the laying houses. They have done very well, and I watched the broods picking out the smaller pieces of this kibbled white maize; the broken flaked maize was, on the other hand, not eaten very readily. To the threefold mixture mentioned I add 5 per cent. of chicken rice and 5 per cent. of grit.

The soft food for chickens is a mixture of Spratt's Chicken Meal, middlings and maize meal with a little raw egg for the first week, afterwards a sprinkling of fish meal. The chickens are fed three times daily. The first feed is of dry chick feed; the drawer, or feeding trough, is supplied with enough to last several hours. At noon a substantial feed of the soft food is placed in one of the round cast-iron pans, which is placed in front of the large aperture in the skirting board of the coop, the water pan being removed temporarily.

In the afternoon the drawer is replenished with the dry chick food, enough being given to last the rest of the day, with a little over for a feed in the early morning before the coops are opened. The quantity fed of all foods is on the short side for the first week, as during that period chickens do not require, and are better without, much food; the yolk absorbed into the body just before hatching takes place is not fully digested. Afterwards they are given as much as they will eat. Onions and chives are cultivated for the chickens; these are passed through a mincing machine and blended raw with the soft food.

Green food is a very important factor in chicken rearing; it is most necessary. The grass in the pens supplies it in a form most preferred, but winter lettuce is given in addition.

At the age of four to five weeks the chickens are moved on to the second stage, the cold brooders.

It is intended in future to make the dry chick feed as follows:

Two parts broken wheat, one part pinhead oatmeal, one part maize grits, the latter being prepared from white South African or flat American maize. To twenty parts of the above mixture will be added one part rice and one part fine flint grit.

A few lines on artificial rearing may not be out of place. As far as this farm is concerned, these will be academic, but they are not founded on surmise—an outsider sometimes has the best view of the game.

There are now four established systems of rearing chickens artificially.

1. The old-fashioned oil-lamp-heated brooder, to hold from 50 to 100 chickens.
2. The cabin system, with heated hover.
3. The long brooder house heated with hot-water pipes.
4. The Stove system.

The first is only suited for the small poultry keeper; the labour and risk involved in attending to a number of these brooders is too intolerable for large numbers. Still, this type of brooder is used successfully with the second or cabin system.

The second consists of a small cabin; the barganette house, the 6 ft. by 4 ft. type, is often employed. If the height of these cabins, viz. 4 ft., could be raised to 5 ft., it would facilitate attention to the hover lamp. This seems to me the best system, and the one I hear the best reports about. It is nearer to natural methods than any other, and I know where it is successfully used for dealing with early chickens. These are, however, kept in the small lamp-heated brooders for the first week, when warmth and freedom from chill are so vital for success. The cabins can be used on the colony system or set in pens; they must be secured to the ground, or they may easily be blown over, and if on the bare ground they must be littered with straw-chaff and set on fine wire-netting to protect from rats. Personally, I think that for all-round purposes and for initial cheapness in cost, the cabin system is the one I should adopt, if I reared artificially.

The long brooder house heated with hot-water pipes, for rearing very large numbers of chickens in April and May, is no doubt quite successful, and probably quite the best method for this purpose. I cannot realize, however, that it is at all likely to answer for January and February broods; I should expect in those months to have wholesale losses from chicken cramp. The chickens in the comfortable quarters afforded by a brooder house will not go out in the open when the weather is cold.

The Stove system when first introduced appealed in theory, but from all I have seen and heard it is about the last method I should recommend for rearing chickens at any season. It requires the most exacting attention, both by day and night. If broody hens can be obtained, there is nothing to equal them for ease, simplicity and security in the matter of rearing chickens at all seasons.

Twenty-one cabin brooders would be required to take as many chickens as we place in our 144 coops. Roughly speaking, one cabin brooder equals seven coops; probably, as far as actual rearing is concerned, it might be equal to six only. There is no question in my mind that far more than six coops could be attended to in the time occupied in giving the necessary attention to one cabin and its hover and its occupants.

Of all the methods, however, the cabin system most closely resembles the coop; the units are comparatively small, one hundred chickens being the usual complement of the cabin, but the resemblance is more especially in this, that the small area of a cabin is not sufficiently attractive to prevent the chickens passing freely in and out, and thereby getting the outdoor exercise that seems so vital to chickens, especially in the early months of the year. Personally, I do not believe it will ever be possible to rear chickens economically in very large units in the first stage of chicken rearing. I have observed that in the brooder house the most successful restrict each unit to 100 or 150 head, in its own divided-off section, both inside and outside the house. The total number, of course, in the whole house may amount to many hundreds.

NOTE.—For further information on the coops, see concluding remarks in last chapter.

CHAPTER IV

THE SECOND STAGE OF CHICKEN REARING: THE COLD BROODERS

The cold brooder is a very important factor in the system, forming as it does a connecting link between the coop and hen and the larger and more exposed conditions of the chicken houses. The brooders, as shown in the illustration, are placed in grass pens, which are 10 yards square, and each pen therefore contains 100 square yards of turf. The grass requires mowing once or twice yearly, and is every autumn dressed with basic slag at the rate of 10 cwt. to the acre.

There are 60 of these appliances, and they take from 20 to 25 chickens each. The brooder is in shape a large box, divided into two equal-sized compartments; one has a boarded floor for the night chamber, the other has the turf for the floor and is the feeding chamber. The opening or trap between the chambers is closed with a perforated slide of metal, which plays a part in ventilating the sleeping-place. The lid of the box forms the roof; it is slightly rounded, and is covered with thin boards and felt. To confine the chickens when the roof is up, a light framework of wood is covered with fine wire-netting; this is on runners and slides right and left, the two ends of the brooder being built lower, to allow both for this and for a current of air to pass over the frame if the lid is shut close down. Over the sleeping chamber the wire-netting on the shutter is covered with canvas, which helps to maintain the temperature and at the same time allows air to escape.

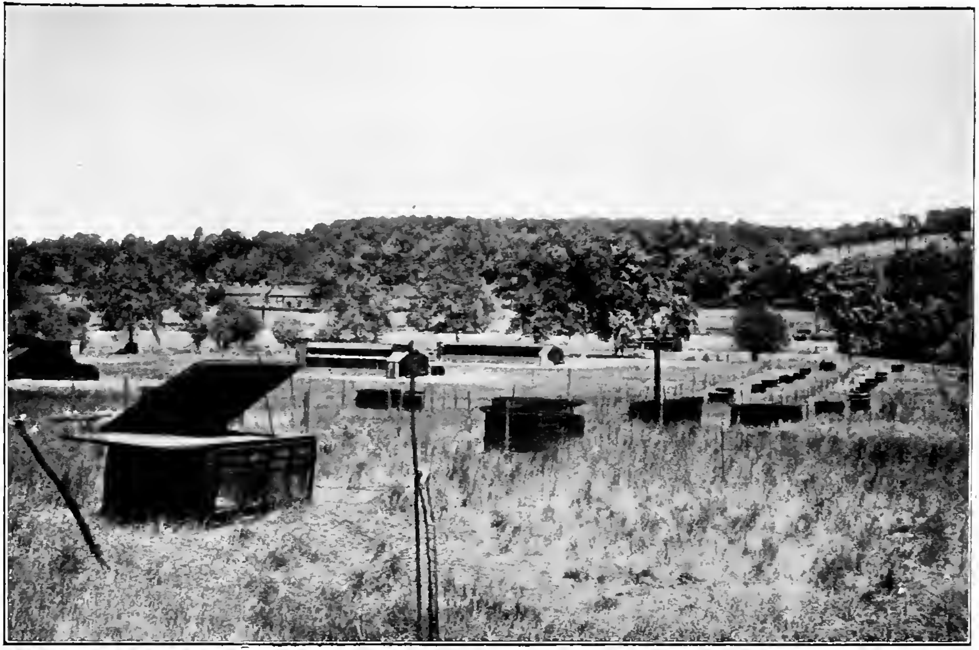
It will be now seen that the perforated slide admits fresh air, and the foul air escapes through the canvas and passes out at each end of roof or lid. The roof can be raised to any angle, to suit the weather and the age of the chickens, by means of an iron stay secured to the top of the front with a loose joint. This works through a bracket screwed to the lid, with a hole in the centre. There are holes in the iron stay every 3 in., and an iron pin, passing through the bracket, the iron stay, and well into the frame of the roof, supports the roof in any position required. In normal weather, and unless the chickens are very young, the lid is kept up about 2 in., thus giving free ventilation all over the top of both chambers.

The trap-door leading from the feeding or day chamber into the run is never closed, but the chickens are confined to the sleeping chamber at night, and the slide that closes the opening between the two chambers is worked by a cord passing through an eye and coming out through a hole at the end of the day chamber, where it is secured to a catch.

The whole appliance is 6 ft. long, 3 ft. wide and 2 ft. 3 in. high; it rests on a foundation frame of 2 in. × 2 in. quartering. The whole is well tarred on the outside every two years, and the inside is treated with water-gas oil, which is obtained from a local gasworks and is similar in appearance and effects to various wood preservatives. The whole front is glazed. The internal is therefore always filled with light, and so conduces to maintain the general health of the broods.

The litter used in the night chamber is sawdust;

PLATE III.



THE COLD BROODERS AND RUNS.

To face p. 22.

this has been proved much the best for the purpose. From time to time, when necessary, the brooder is moved to a fresh site in the run.

At the back of the day chamber is a small doorway; through this the feeding is done. In the feeding or day chamber there are two shallow wooden troughs, each 2 ft. long, 6 in. wide and 2 in. deep, one being used for soft food, one for corn. The chickens are fed twice daily. In the afternoon, in one trough is placed enough grain to last twenty-four hours. At midday a feed of soft food is given in the other. If any remains when the afternoon dry food is given, it is taken away.

The soft food is similar to that given to the younger chickens. The fish meal may be increased up to 5 per cent., but not more, of the total ration. Ten per cent. is the amount usually given to adult poultry of the total ration. Biscuit powder may replace the more expensive chicken meal. The corn feed consists of two parts whole wheat, one part groats and one part finely kibbled maize; flat maize is much preferred. Water is given twice daily in an iron trough at the back of the brooder, out of the sun. Fine flint grit is supplied in a shallow box or trough.

At the age of nine weeks the chickens pass on to the third stage in the chicken houses. They could be kept in the brooders up to the age of three months. If short of room the cockerels of the last broods remain in the brooders till killing age.

The plant is in operation from February till August; in the other months it is resting. Unlike the coop plant, it is permanently set out.

CHAPTER V

THE CHICKEN AND YOUNG STOCK HOUSES

It is one of the principles of the system to keep the chickens in small units while of tender age. When reaching the third stage they immediately are managed in large flocks of 150 to 300 head.

It is obvious that with the tendency of all chickens to pack closely together at night before they have learnt to perch, some steps must be taken to break up the large units into small ones when first they are housed, if disaster is to be avoided.

The three chicken houses are in one long range, 252 ft. long; the building is 8 ft. wide. There are three complete houses, each of which will hold up to 300 head. Each house can be divided up into eight complete sections. The practice is to let the whole flock run together during the daytime, but to shut them off into lots of 30 or 40 each at night. The chicken houses are stalled off every 10 ft. by a stall that extends 5 ft. across the house from floor to ceiling. A light wire-netted door is hinged to the front, 3 ft. wide, opposite each stall. This closes so that it meets the stall, and when fastened completely closes the section; when open the door swings back against the front.

The regular practice each evening is for the attendant on duty to first drive all the chickens in the runs inside the house. He then passes right through the building, dividing the chickens as he goes into units of 30 to 40 and closing the wire-netted doors behind him. They are then perfectly safe, and can sleep on the floor or on the perches, as they may elect.

It is quite easily and quickly done, always provided the poultryman is in good time, before the light goes, while the chickens are on the run and have not begun to settle for the night. If, however, they are left till it is getting dusk, they will pack one on the other in scores, probably all in one compartment, and numbers would be suffocated. This is the easiest and safest way I know for dealing with large numbers of chickens at the critical time before they have learnt to perch.

The perches are 2 ft. long, and are placed over a shallow manure pit at right angles to the back of the house, as is the case for all perches in every house on the farm. The perches are placed 14 in. from the floor only, in order to induce the chickens to perch as soon as possible. They soon learn to do this, and when well established in this practice they can be moved into one of the large houses reserved for growing stock. In these they meet the same conditions such as they will experience for the rest of their existence, as the houses for young stock are equipped and are of the same type as those provided for the layers, with one small exception, which is, they are stalled off into two or at most three sections, while the laying houses have three stalls and are in four sections. It was found that too many sections led to a tendency to overcrowding in one or two, while leaving others empty or nearly so.

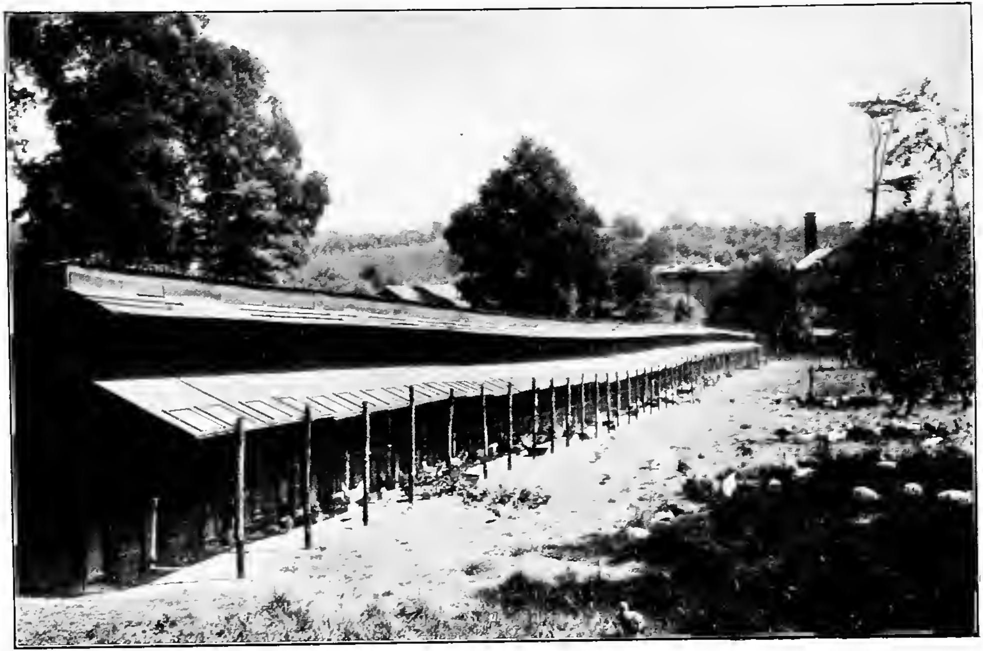
Further details of the chicken houses are as follows : The height in front is 7 ft., at back 6 ft. ; the length, as already stated, of the whole building is 252 ft., each of the three houses being 84 ft. long and 8 ft. wide. The skirting board, 2 ft. high, in which are the trap-doors, has glass windows every 3 ft.; wire-netting extends from the skirting board to the roof. The top 1 ft. of netting is always exposed, and is protected by a hood; the remainder can be covered by shutters hinged on to the front. In the early months these are buttoned down, so that the front is completely closed except as to the top 1 ft. of netting; as the weather becomes warm they are raised at the angle shown in the illustration. They are secured with a hook and eye and a stake. The shutters are also glazed.

The boards at the back of the house are covered with felt to a height which reaches well above the chickens' heads when at roost.

For the purpose of handling the chickens easily the houses must be narrow, in the nature of a passage, otherwise it would not be possible to move them rapidly to the right or left as required when settling them down for the night. The roof is of corrugated galvanized sheeting over boards. The house may appear somewhat elaborate, but it deals with 5,000 to 6,000 chickens every season, which are worth taking care of. Compared with the old-fashioned plan of putting chickens at this age in small colony houses, it is an enormous labour-saver, with a concurrent improvement in health and a low death-rate. Like every house on the farm, the floor is of cement concrete, impervious to rats; also, as in the case of all the poultry houses, wire-netting is sunk round the outside to prevent these pests burrowing under the floors. Each of the three houses has its separate run of grass; these are about 40 yards by 30 yards, and it would be better if it were possible to make them larger.

The houses are occupied from about the middle of March to the middle of August. Directly they are

PLATE IV.



THE CHICKEN HOUSES.

To face p. 26.

vacated, the grass in the runs is dressed one year with basic slag and the next with lime. During the autumn a good crop of grass is grown, which is cut and carted off and fed to the horses.

The chickens are fed twice daily. A substantial feed of soft food is given in the troughs first thing; about 1.30 p.m. sufficient corn is thrown in the litter to last them till the next morning, and a little to spare. Straw is used as litter over a thin coat of engine ashes; this is the standard litter for all the houses. For quite young chickens, care must be taken that it is not spread deeply, but a little can be added from time to time. Half way through the season the houses are cleaned out; at the end of the season they are cleaned and thoroughly disinfected. During occupation they are every fortnight lightly sprinkled with Izal powder. The soft food is of the same constituents as for the brooder chickens, but cooked vegetables of various kinds are also added. In the chapter on Foods this question of vegetable feeding will be gone into at length. Wheat, broken maize, wheat screenings comprise the bulk of the corn, but we also try to get them on oats as soon as they will eat them. The troughs are long and narrow, about 6 in. in width over all. They are raised 1 ft. from the floor and have narrow perches running parallel to and about 3 in. from the sides, on which the chickens sit to feed. The perches are carried on short pieces of narrow battens, nailed and riveted to the bottoms of the troughs. Fine flint grit is supplied in narrow boxes outside.

Chickens eat a good deal of grit, whereas adult poultry, supplied with plenty of shell and a smooth substance called "Calcomar," will not touch flint grit. I have observed before that adult poultry appear to prefer smooth round mineral matter to flint grit. On this farm we give no flint grit to the laying stock, but as the chickens appear to have a craving for fine flint grit, so far we continue to give it. Whether it is necessary or helpful I cannot say. This matter of grit or no grit has now become a matter for controversy. As soon as the chickens have learnt to perch regularly, with the pressure of the succeeding broods behind, they are moved on to semi-intensive houses. These are either of the same type as the laying houses or form part of a long range, 280 ft. long, which is divided into seven complete houses. This range of houses was built originally for intensive poultry keeping, which was discontinued as not proving satisfactory. For a short time it was then used with outside runs for laying stock. When the complete separation of the laying stock department was made from the department concerned with young stock, the range of houses was adapted to the use it now has, viz. to house young stock until they are either required for the laying houses or, in the case of cockerels, sold for the table. It performs a very useful service in this way much better than for either of the other uses it has been put to.

If, however, I were laying out a farm with plenty of space, I should not build any ranges of houses at all, except for the purpose of caring for chickens until they will perch. Even then perhaps it would be better if they were detached; the runs would be larger. This is the great drawback of all ranges—the runs must be very restricted as to size. The great length of the chicken houses does, however, meet the disadvantage a long way.

The range is 280 ft. long and 16 ft. deep, and is divided into seven houses. These semi-intensive houses, as the detached semi-intensive houses, are exactly fitted and equipped and managed as to feeding, etc., for the growing stock as the laying houses for laying stock. As I shall give a minute description of the laying houses and their management, I will not say more about the plant for the growing stock in the fourth stage, except to say besides the seven houses in the range there are six more large houses of semi-intensive type for growing stock and that they are on free range. Altogether we can comfortably house 1,000 in the range and 1,000 in the other half of the plant.

The 1,000 head in the range of seven houses all run together at free range, and the curious thing is, we have no overcrowding; each flock keeps most religiously to its own section in the shed. Of course, they are not all filled at once; not more than two are filled at a time. The chickens are confined entirely to the house for two nights; after then the door is opened and they run at large.

The land on which the young stock exercise is under grass, and gets several months' rest each year. It is treated annually with soil disinfectants, such as basic slag, lime and salt, the latter being used in solution on the bare land in the immediate vicinity of the houses. It is probable the use of these disinfectants, especially of salt, has solved the problem which at one time seemed insoluble, viz. how to keep poultry in large flocks in fixed houses on the same site year after year. The theory is that the continual use of the disinfectants sterilizes the land and renders it unfit for the propagation of disease germs.

As the poultry are nearly all either first-crosses or of the general-purpose breeds, it is practicable to run cockerels and pullets together until the cockerels reach killing age. In fact, in these varieties it is hardly possible to certainly distinguish the sexes until they are about 2 lb. to 3 lb. in weight; also, a large proportion of the cockerels spend ten days to a fortnight in the fattening cages, where they are trough-fed before being sold. One of the six semi-intensive houses is, however, reserved for the stock cockerels. This is built in a meadow reserved for ducks, a long way away from the pullets and layers. In this we put young cockerels that show signs of superlative merit, and the few White Leghorn cockerels bred as soon as they begin to be troublesome. As these birds develop, a proportion of the best are again selected for the farm breeding pens; only about 50 or 60 are required. In fact, the dropping of the setting-egg trade has been a great relief in that it has given more room for the pullets and a saving in the heavy expense involved in breeding, selecting and keeping for many months several hundreds of male stock, which as they grew older were often an infernal nuisance, fighting and injuring the weaker birds amongst themselves and getting amongst the pullets over the fences. I have now been able to abolish all fencing amongst the young growing birds, to their advantage and with a considerable saving in expenses.

The feeding of all these young stock is the same as for the adult stock—soft food in troughs in the morning and corn in the afternoon in the litter.

Most of the cockerels are passed through the fattening cages before being sold for the table; here they are trough-fed for ten days to a fortnight. Care must be taken not to keep them in the cages too long, or they will lose weight instead of making it. For the very early chickens sold at the weight of 2 lb. or 2½ lb. it is doubtful whether it pays to put them in the cages at all, but from 3 lb. upwards it certainly does.

PLATE V.

HOUSES FOR YOUNG STOCK.

To face p. 30.

The cages are 3 ft. long and 1 ft. 9 in. deep, 2 ft. high, with solid sides and backs, with barred fronts. As the cages here are used only through the warmest months, they are outdoor cages, with boarded and felted roofs. They stand on legs about 2 ft. 6 in. from ground level, with barred bottoms. The correct measurements for all barred bottoms is to place the bars 1½ in. apart, no more and no less. The bars for the front should be 2 in. apart. Tile battens 1 in. × ¾ in. are used for all work of this kind. To save time and for greater cleanliness, manure boards are fixed about 9 in. below the barred bottoms ; these slide on strips nailed to the legs of the cages. The feeding and water vessels stand on a 6-in. platform running along the front of the cages. The chickens are fed on soft food in the morning and corn at night ; the corn may be soaked, as for the ducks.

Three cages are built up in one section ; each cage holds five cockerels. As there are 36 of them, 180 birds can be dealt with at once.

CHAPTER VI

THE INDIAN RUNNER DUCKS

THE flock of ducks, 200 in number, are of the above breed. As the management of laying ducks and the rearing of the same differ a good deal from the methods employed with laying hens and chickens, I will confine a description of both to the one chapter. Indian Runner ducks are kept because they excel as egg producers : we are never without eggs all the year round. They are hardy and excellent foragers. On this farm they have practically free range, with plenty of water, a stream running through their location, and they have also access to a pond. A good deal of the land they occupy is swampy and unfit for hens. The adult stock are housed in houses similar to those occupied by the laying hens, but they are devoid of any equipment except feeding troughs, and they are not stalled off, but left quite open.

I should not keep ducks here on land suitable for laying hens, as they require more room, and on the whole I think the laying hen the more profitable factor of the two. It is very necessary to make the houses absolutely rat-proof. Ducks are more subject to panic than hens, and, important as it is to keep all laying stock quiet and undisturbed, nervous shocks have a particularly disastrous effect on the egg production of ducks.

Rats have a very disturbing effect, and if they get in amongst the ducks—which of course sleep on the floor—the frightened birds can be heard at some distance. I have known, too, ducks to be so seriously bitten by the brutes as to cause their death. In one case five ducks were injured so badly one after another that they either died or had to be destroyed.

Although ducks revel in water and mud in the daytime, if good laying is to be expected they must have a perfectly dry sleeping-place, well littered with straw. In the straw around the sides of the house they will form their own nests, laying their eggs mostly early in the day. It is necessary to keep them confined until about 9.30 a.m., or even a little later. They make up for it at the other end of the day, as they do not care to come in until it is nearly dark. Ducks require careful feeding if they are to be productive: they are larger eaters than hens. Here we give them a substantial feed of soft food for breakfast, composed of the same materials as for the laying hens and to be presently described, except that for the ducks the fish meal is increased. At night they have a mixture of two parts cracked maize to one of oats, but this is soaked in water for several hours before being fed. They require plenty of shell. It is generally considered that one drake should be kept to six ducks: personally, I have found 10 in 100 head ample, and better than more. They may be kept profitably for four laying seasons: their longevity is slightly greater than hens. Some writers recommend keeping them for five or six seasons even, but for winter laying it is desirable to have some young ducks annually. Owing to the bad effect fright has upon their production, we only handle them once yearly in September, when the oldest ducks of four seasons are withdrawn. Each year the young ducks are punched through the web of the foot and a record entered up.

There are two webs to each foot, so four markings are obtained—outside web, right foot: inside web, right foot: the same for the left. If a fifth is required, the ducks can be left unmarked for one season.

In the 1921 Dairy Show number of *Eggs*, the organ of the Scientific Poultry Breeders' Association, an interesting article by Mr. Harold Paine discusses the origin of the Indian Runner duck. By this it appears the first specimens were imported into Cumberland many years ago from India, and owing to the great prolificacy of the ducks, the drakes became in great demand for crossing with the farmyard ducks of the country. The Indian Runner, being very prepotent, impressed its peculiar carriage and activity on the native ducks, and so the variety spread over the country, but as a cross-bred. Type, by selection, has been more or less restored, but it still maintains its cross-bred attributes of vigour and stamina and maintains its fecundity. It gives evidence of its cross-bred nature in the variations that exist in colour, carriage and shape, and in the colour of the bill. A white variety has been evolved, but personally I prefer the fawn and white variations for utility purposes.

They seem to me of late years to have lost a good deal of their upright, bottle-like carriage, and perhaps it is as well. I note that the drakes I buy yearly vary a good deal in size and appearance, according to the part of the country they come from, the smaller coming from the north. They are very useful and profitable birds, and where there is plenty of room, or on low-lying land too wet to be suitable for hens, they will prove satisfactory and profitable adjuncts.

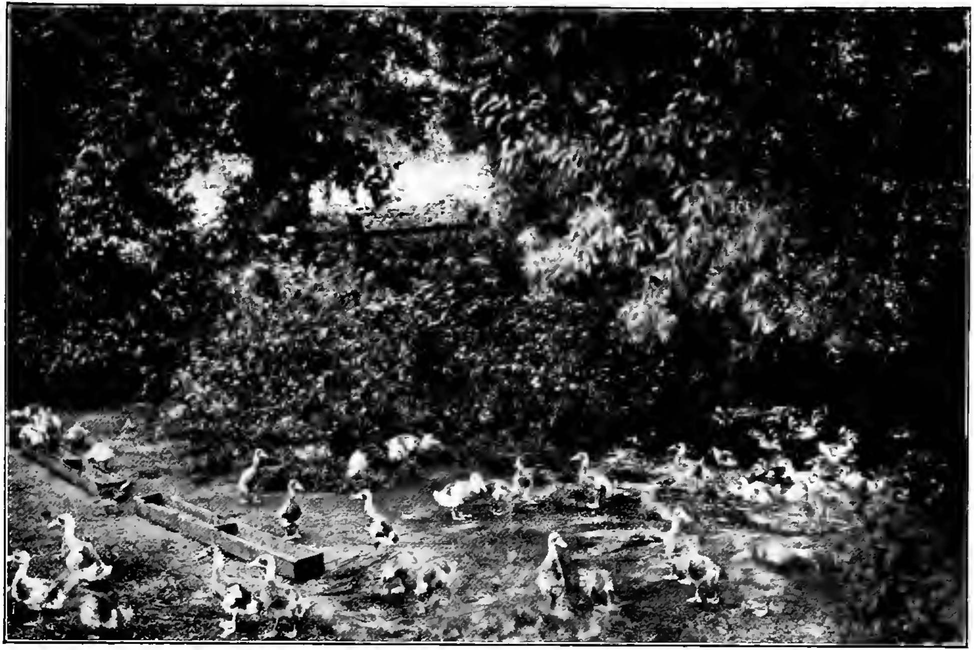
Ducklings are easier in some ways to rear than chickens, when you know how. When very young they must not get wet: they cannot, also, stand hot sun.

Unlike chickens, a rearing shed is far better than coops for their accommodation. We do not rear many, but it paid to put up a house for the purpose. This is a half-sized laying house 25 ft. by 14 ft. It has a hard concrete floor and is well protected against rats by fine wire-netting sunk in the ground and carried well up outside the building. Low boarded hurdles the width of the house are used to divide it into five sections, each 5 ft. by 14 ft. In each of these a hen can take 40 ducklings, 200 in the whole house. They are bedded on wheat straw, drawn out and spread evenly. For the first week they are confined to the house. After the first week temporary runs are set out in front of the house, each one communicating with one of the inside sections by a trap-door. Run-ups are formed of turf and soil: young ducklings are tender and easily hurt. If rain comes on they must be driven inside at once. The floor of the runs is ashes, as they must not be allowed to become draggled with mud. If the weather is cool they may be kept to the house and runs till three weeks old. If, however, it is hot after a fortnight, the runs and hurdles are taken up and the hens are removed, and the whole become one flock and run together in their enclosure, part of which appears in the photograph. All along under the trees is a narrow clean stream, and the ducklings go in and out as they like. If they do this the hot sun does not affect them: but if they were kept confined in the shed and runs they would have to be driven inside during the part of the day when the sun beat on the front of their house.

They are fed at first on a piece of canvas bagging spread on the straw, and receive a crumbly mixture of Spratt's Chicken Meal and middlings. After the first fortnight the expensive meal is discontinued, and they are fed on middlings, maize meal and biscuit powder—the latter is a by-product from biscuit meal which consists of coarse particles: they also then have a little fish meal in the mixture. The fish meal is increased as they grow older. They are tremendous eaters, and are fed five times a day for the first month, and then four times. While young, water is supplied in shallow pans in which are stones and sand, the former to keep them from getting wet and the latter for them to clean their beaks in. When between nine and ten weeks old the drakes are sorted out: those not required for stock are sent to market. It is important not to let them get too old; if they do, they begin to moult and become spuddy, and their value is much deteriorated for table. The ducks quack when handled, whereas the drakes make a sort of squeaking, whistling noise. As they are handled the ducks and the drakes kept are punched with the punch of the year, which is entered up in the stock book. We use a punch such as is used for punching holes in leather. This is driven sharply through the web by a blow from a hammer, an assistant holding the foot on a solid block of wood. The hole must be of good size, or it will grow up again. As it is, we often have to detect where the hole has been by the cicatrix. The ducks are now treated as store ducks, and are fed three times a day. Some bran is given in the soft food. At night they have soaked corn, as for the laying ducks.

In September the oldest ducks are drafted out, and the young ones, now approaching six months old, are gently driven to their future quarters, in front of which they and the remaining older birds are confined for a few days by a temporary wire-netting fence. There seems to be one time—and one only—in the year when it is best to hatch ducks, viz. in the latter half of April:

PLATE VI.



INDIAN RUNNER DUCKLINGS.

To face p. 36.

the eggs hatch better then, and the ducklings are stronger and make the best ducks. I always have mine off in the last week of April. We put 12 eggs under each hen, and set from 16 to 20 hens yearly. If the above instructions are carried out, the losses should be almost nil. It is important to remember that until they go in the water they must not be exposed to either rain or hot sun, and they must not be allowed to get into muddy ground until their feathers are grown—I mean mud in which they would sink.

The eggs take from 26 to 28 days to incubate, and ducklings often hatch slowly. The treatment of the sitting hen is exactly the same as for chickens.

CHAPTER VII

THE PURE BREEDS, THE FIRST CROSSES, AND GENERAL SYSTEM OF BREEDING

THE breeds, as mentioned in the first chapter, reserved as pure and for the basis on which the first crosses will be bred, are White Wyandottes, White Leghorns and Rhode Island Reds. Very possibly other breeds will enter into the first crosses: the Houdan certainly. It will be always easy, by buying a few eggs, to obtain hens of other suitable varieties for crossing with the males of the standard breeds kept.

If my anticipations prove correct, that by substituting first-crosses for the pure-breds which have hitherto been the stock the general results are improved both as to production, vigour, health and longevity, first-crosses will by degrees make up the great majority of the laying flocks in the future.

Pure-breds must still be bred and kept to provide the pure breeds from which first crosses are derived. The number of the pure-bred flocks can be kept to a minimum by buying eggs for breeding pure breeds of other varieties. The breeds and first crosses chosen for the future stocking of the farm have been decided upon only after long and careful consideration and after obtaining all the advice and information that I could avail myself of.

I am not a stranger altogether to first crossing, as I bred many in years gone by.

The pure breeds, White Leghorns, White Wyandottes and Rhode Island Reds, are the three breeds that have above all others received the careful attention of the specialist breeders. They have in the utility strains been carefully selected and bred for prolific egg production by the aid of the trap-nest. Still, although I am fully aware of the great benefits that have resulted from the specialist breeder's efforts, and am even prepared to go so far as to say that by raising the general average of production he has made commercial poultry farming a paying proposition, and that it is essential we should still continue to avail ourselves of his co-operation, I do not think that the pedigree pure-breed will continue to hold the field on poultry farms devoted to the production of eggs and poultry for consumption.

Very great fecundity, coupled with in-breeding, are resulting in a weakened stamina in some of these most highly bred stock.

The subject is a most difficult one to deal with. On the one hand, a reasonably high production is essential to the commercial poultry farmer: equally so is high vitality and vigour. The pedigree breeder who distinguishes himself by his success in the laying competitions and by his general records naturally obtains high prices for his eggs and stock, and deserves them. He can, however, afford more failures than we can. We must be able to rear the large number of chickens required yearly easily and with certainty: we cannot afford to rear stock to maturity of which a sensible proportion are unable to bear the strain of production and fade away.

From my own experience, from what I have observed generally, there is little doubt in my mind that extreme fecundity with in-breeding have set up conditions in some of our pure-bred stocks which, if they became more accentuated, would be fatal to the commercial side of poultry culture.

It is becoming more difficult year by year to avoid in-breeding as the selected utility strains become more related.

A friend who has had a very wide experience indeed of poultry, and who occupies a position in which it is easy for his judgment to remain unbiased, said to me not long ago that these are the days of the pure breeds, but it is an open question whether they will continue. Personally, I do not think they will. I believe, like the general farmer, who usually, for commercial purposes, breeds cross-bred cattle, sheep and pigs, we shall breed cross-bred poultry, and, like the farmer, we shall confine ourselves, if we desire the best results, to the first cross. This involves keeping some pure breeds, I am aware, and we shall by most careful selection have to try to keep these as vigorous as possible; and although I have indicated the breeds I have decided upon for the present, it does not follow that these will always be the most suitable for commercial work. No one can look far into the future and predict what will happen in a few years' time. The whole question is very controversial. While some, like myself, deprecate in-breeding, others claim that the remedy for the depreciation—which they admit—is to in-breed more. They argue that as in-breeding intensifies weakness, so in-breeding will intensify vigour, if due care is taken in selecting and only mating the healthiest and most vigorous specimens of the race ; and yet those who advocate this means of restoring the stamina, which they agree has been depreciated, also admit that if in-breeding is carried too far sterility will

PLATE VII.

A VIEW OF THE BREEDING PENS.

To face p. 40.

result. These arguments do not appeal to me at all. It is impracticable to select these perfectly sound individuals; we cannot detect latent weaknesses, and, at any rate, the commercial poultry farmer cannot carry out these intricate, uncertain and complicated methods of breeding. I am much more inclined to think that our best modern so-called pure breeds—which have after all not long been evolved from the blending of certain distinct breeds or varieties—can best be maintained in a vigorous condition by an occasional judicious out-cross, possibly back to one of the varieties from which they sprang, or to another variety with not too dissimilar characteristics. I practised this with some success in years gone by. As illustrations I may mention the following: I bred Black Leghorn–Barred Rocks, Brown Leghorn–Rhode Island Reds, Buff Rock–Rhode Island Reds, Brown Leghorn–Partridge Wyandottes, White Leghorn–White Wyandottes, White Leghorn–Barred Rocks. All these proved successful out-crosses. I used the cockerels of the breed I wished to introduce; the Black Leghorn in the first-mentioned cross was the cockerel, and the rest follow in like order, the male bird first. I mated the half-bred cockerels from these matings to the breed, such as the Barred Rock, that I wished to out-cross. In a generation or two the new blood was absorbed and type became restored. There were others, such as the Buff Leghorn cockerel to Buff Rocks and Buff Orpingtons, and some I have forgotten. The fancier has out-crossed, we all know, particularly in the White Leghorn. I remember—it is nearly twenty years ago now—when the then manager of this farm, which was at that time mainly run for breeding exhibition poultry, mating White Leghorns to Black Langshans for the purpose of getting size and the length of leg which unfortunately then began to characterize the exhibition White Leghorn. Black is after all the colour nearest akin to white.

Only last year I ran three rather interesting experiments. I mated White Rock cockerels to selected White Leghorn hens, exhibition White Leghorns to selected utility hens, and exhibition White Wyandottes to utility hens. My intention was to restore size and vigour to the utility flocks, with the growing decrease in the size of which I began to become alarmed. The Rock cross was not a success : the males came all colours and the pullets most decidedly favoured the Rock type rather than the Leghorn. I will refer to this fact again. The cross between the two strains of Leghorns was most successful. We bred excellent birds, both in males and females, the pullets being about the best layers of any during the succeeding autumn and winter. The cockerels were strong, hardy and vigorous. There were none of those diminutive, weakly specimens which are becoming so common amongst highly bred pedigree White Leghorns. This out-cross will, I believe, restore the desired size and vigour in my Leghorns for some generations. The cross between the two strains of White Wyandottes was a failure : the cockerels, tried singly or together, failed to fertilize but a small proportion of the eggs, and the few birds bred were of a bad type.

The first crosses mated for a commencement were mentioned in the first chapter. They are White Wyandotte cocks to Rhode Island Red hens, White Leghorn cocks to Rhode Island Red, White Wyandotte, Buff Orpington and Light Sussex hens. There are about an equal number of each of these varieties mated to the 10 White Leghorn cockerels. One advantage of crossing is that several crosses can be bred in one flock. The third crossing breeding pen consists of 160 White Leghorn hens mated to 10 Houdan cockerels.

I will now explain the proposed object of these matings. It will be observed that in the first two the cockerels are from the most fecund and the lightest breeds.

My own view was that the light cock should be mated to the heavy or general purpose hen, and not the heavy cockerel to the light hen. This opinion has been further confirmed by the unsatisfactory result attained by mating the Rock cock to the Leghorn hen. I believe we should have had a much better layer the other way about. Various inquiries also made amongst our scientists and practical experts, with one exception, all support the above contention, and the one I have put into practice.

I have had the advantage of actually seeing in this neighbourhood the result of mating White Wyandottes and Rhode Island Reds both ways. I much prefer the hens obtained by using the White Wyandotte as the male. They were of excellent shape and type, of pretty pile markings, red and white, and their owner gave them an excellent character as layers. The crosses between White Leghorn and White Wyandotte, and also the first-cross Leghorn–Orpington I am acquainted with. They were satisfactory both as to appearance and result. I have not seen the effects of crossing White Leghorn cocks to either Rhode Island Red hens or Light Sussex: but the assumption I should come to would be that they would be both quite good, especially the former.

In former years I bred hundreds of Houdan–Leghorns, always using the Houdan male. They were the best of layers. A friend who has seen them crossed the other way told me the results were not nearly so good.

The Houdan is a very old breed. As a boy, some forty-five years ago, I had a Houdan hen amongst my very small stock—so small that I practically could recognize each hen's egg. I remember this Houdan hen was a very excellent layer, and I kept her till she was five years old. Modern Houdans have not a very first-class reputation as layers. If the cross, however, proves as good as it used to be, breeders of Houdans should experience a good demand for their cockerels. I would, however, suggest that they should import some fresh stock from France, as the Houdan cockerels I have obtained fail on the point of size. The Houdan–Leghorn cockerel makes a high-class spring chicken, with good breast and white flesh.

The above opinions on breeding for commercial purposes will not be endorsed by everyone. I believe them to be sound. If time proves me to be wrong, I shall only have the satisfaction of knowing I am in good company, as I have consulted very good men who have great experience, and who have had opportunities of watching events over a wider area than I have had.

The subject is a very serious one indeed.

Breeding, feeding and housing are the principal factors in the care of layers. If either one or the other is badly done, the result will go far to mar the success of everything else concerned with the economy of a commercial poultry farm.

A very great responsibility rests on the pedigree breeder, as it is upon him the commercial man must depend in the first instance for the provision of the pedigree stock, which must be the foundation of the strains of profitable poultry, whether pure or crossed. It is not the job of the commercial poultry farmer to select by the trap-nest and attempt to breed his own pedigree stock. The breeder, whose business it is to breed, can specialize on this work: he will do it far better than we can, and more cheaply, more reliably. We must hope that circumstances will encourage him to concentrate both on fecundity and vigour: the one is not much good without the other.

Scientists tell us that if the genetics of both parents are fixed for fecundity, the offspring should without any doubt inherit the capacity for producing eggs in profitable quantities. By genetics it is meant that certain characteristics and faculties have become fixed by selection in breeding and thereby become hereditary. By crossing two breeds whose genetics for fecundity have become fixed, I am hoping to increase vitality without losing the power of high production. It is futile to breed for high egg production unless the subjects have the necessary stamina to deliver the goods, or even if the exceptions that fail are much in evidence.

Dr. B. F. Kaupp, a specialist and experimental breeder of the North Carolina Experimenting Station, visited this country during the last summer. He came over as an American delegate to the World's Poultry Congress. I had the pleasure and advantage of entertaining him here, and he looked over the farm. We talked much on breeding. I confess his statement that breed in itself did not matter, that the genetics of the stock really only counted, whether pure or cross-bred, surprised me. It is not for me to dispute with such an authority. I have, however, in common I think with the majority of breeders, been under the impression that to breed from cross-breds, either first crosses or otherwise, would be to risk losing the faculty of producing a large number of eggs by their offspring, as they would be likely to revert more to the characteristics of their ancestors, of which the average production would be the unprofitable output of 80 to 90 eggs per hen per year, of the average life of three years. In breeding cattle and pigs for commercial purposes we breed from cross-bred dams, but depend upon pure-bred pedigree sires for impressing on the offspring the characteristics we are out for, and we get them. Still, breeding for egg production is not the same thing as breeding for flesh and frame, or even for milk. If, however, equally good results could be obtained by mating cross-bred hens to pure-bred cocks as from pure-breds or the first cross, the problem would be simplified. My own impressions are that we should not get as good results, and I should feel strongly disinclined to risk it, except perhaps in a very tentative way for the purposes of research and interest.

Our present knowledge would altogether indicate that a lowered output must result, as fecundity would have to be maintained by the male bird only, whereas with the first cross both sides would directly inherit the power of high egg production. Dr. Kaupp's own experiments, which I am about to relate, seem directly to support, if not substantiate, this contention.

These experiments of Dr. Kaupp's were published at length in the November 4, 1921, issue of the *National Poultry Journal*, 3 Vincent Square, Westminster, S.W.1.

The following is a summary. Dr. Kaupp commenced these experiments in 1914. Ninety common hens, White Leghorns bred in a "hit or miss" manner for years, were mated to common cocks of the same breed. These hens' average production for their three years' life was 89 eggs per hen per year. The pullets bred from this flock averaged for their three years' life 92 eggs per hen per year. In their second year the first flock were mated to three pedigree cocks, all full brothers. The average from the hens bred from this mating at once rose to 135 eggs per hen per year for the three years' life.

The second flock were also mated to pedigree males: their average for the same periods rose to 138 eggs. An unprofitable production at once became quite profitable by the influence of the pedigree males.

The results of the remaining experiments were equally striking. Pedigree hens were mated to pedigree cocks, and the average rose to 163 eggs per hen per year for the three years' life. Dr. Kaupp proceeds to draw from these results the obvious conclusions that high egg-production qualities are transmitted by the male to his daughters. These tests also show that when pedigree hens and pedigree cocks are bred together there is still higher production. It therefore appears that high egg production is transmitted by both sire and dam. The experiments bring out the interesting point, which is that to obtain a large number of eggs hens must possess this inherited power of high egg production. If they do not possess this factor, good feeding, housing and care will not alone produce large numbers of eggs.

These practical experiments are extremely interesting and instructive. They indicate most emphatically the importance of breeding right. I am not one of those who expect or depend upon the very high yields we hear so much about. I can make the farm pay at a 110 egg average per hen per year on a three years' life; I want 120 to do well; I can do still better at 130. These calculations are based upon getting a decent winter yield.

Dr. Kaupp's experiments show how much will depend upon the stock in the three pure-bred pens I have referred to as being the source from which almost all the 6,000 head of laying stock will be obtained, as these three pens of birds will supply the breeding stock in the three pens reserved for the first-cross breeding.

In these three pens of pure-breeds I must take every possible care to see that the cocks are true pedigree stock—that is to say, that they are bred from proved layers and sired by cocks also bred from recorded hens with good records.

For these I must depend upon specialist breeders of known reliability. The hens must be also very carefully selected, and enough pullets hatched in January and February to allow for selection to fill the yearly wastage.

The future success of the farm as a commercial entity will greatly depend upon the management of the three pens of pure-breeds. At the same time the change simplifies everything, and affords opportunities which were denied when the whole farm consisted of breeding flocks.

NOTE.—See concluding remarks in the last chapter.

CHAPTER VIII

THE HOUSES FOR THE LAYING HENS

THE pioneers of commercial poultry farming had no precedents to guide them; we had to work out our own salvation.

We made many mistakes, and it took some determination to see it through.

We kept our birds in small flocks, and for a long time 12 to 15 were considered the right number for a flock. These were housed in small houses that were little more than roosting places. All food was fed on the bare ground. Large flocks of birds took toll of this. There were of course an immense number of houses, each in its own small pen. Food and labour were cheap, and the small profits were mainly derived from the trade for setting eggs.

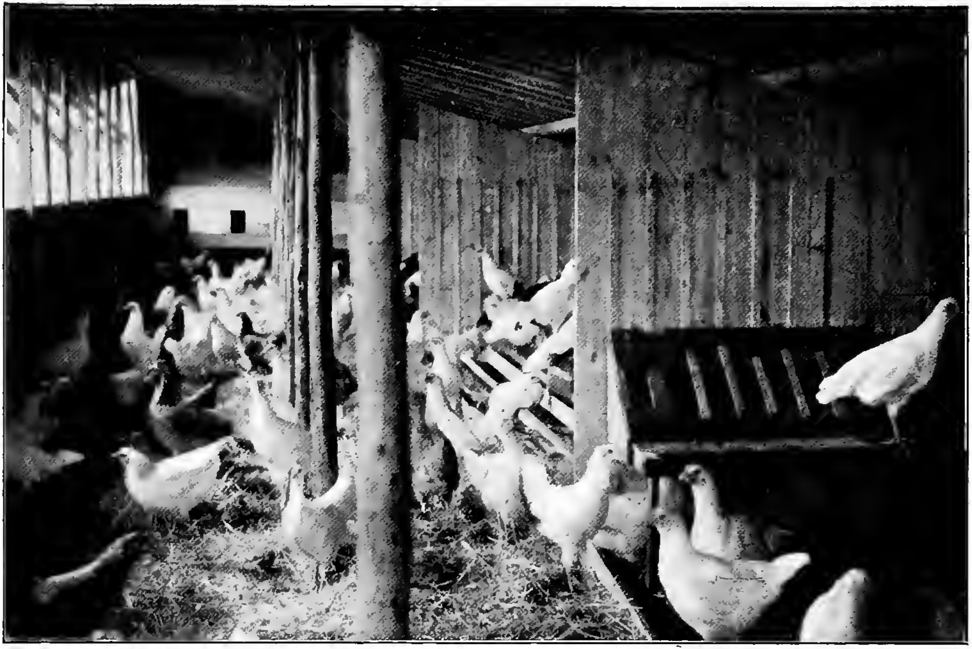
The advent of the large laying house made commercial poultry farming a practical proposition, both by greatly reducing the cost of labour and in the much larger number of birds that can be kept to the acre. Right up to date improvements are taking place. Readers who have read the first edition will note that many small developments have taken place on this farm, which mean a good deal in the aggregate. As I have indicated, the whole of the layers are now concentrated in one department. The staff concerned with laying stock have no anxieties about young stock; they are expected to fix their attention on learning the best way to manage laying stock, having no other abstractions to divert their minds.

The 6,000 laying stock—the average is fully this number—are housed in 37 houses. They are worked in two equal sections, with a leading and second poultryman on each. This works out at 1,500 head per man. This large number per man—much larger than at one time thought practicable—could only be run satisfactorily by adopting every labour-saving device that occurred to us. The work is done in shorter hours than formerly. The day's work begins at 7.30 a.m. and ends at 5.30 p.m. At 12.30 p.m. on Saturday the general work ceases, and those whose turn it is for a week-end off leave.

The system on which the farm is worked is the Semi-intensive System. Practical poultry keepers would take this for granted, and would understand what it stands for ; others may wish for a definition.

The Semi-intensive System is a method by which much larger numbers of birds may be kept to the care than was formerly thought possible. They are kept in large flocks or units, in well-built, airy, light houses, well littered, and made attractive to the birds in every way, so much so that they spend the larger portion of their time indoors, exercising themselves by scratching in the litter for the grain fed therein. They use the outside runs intermittently for green food and for outdoor exercise, but seldom wander far from what to them is the centre of their existence, their own particular laying house. Different views prevail as to what constitutes the most economical unit ; in other words, what is the most profitable number of birds to put in one flock. There are many flocks which are composed of 500 birds. Certain enterprising men have reached 1,000, or even more ; but as far as I know no one has kept

PLATE VIII.



A LAYING HOUSE FILLED WITH PULLETS.

The nest box on the left has been removed and the second door fixed since the photograph was taken.

To face p. 50.

successfully any other breed either in this country, or in America, except the White Leghorn in these large units. The White Leghorn seems particularly adapted for this work, as it lines up well throughout the very long houses successfully, whereas the Wyandottes, where they have been tried, overcrowd, and leave a portion of their roosts practically empty. Personally, I should not care to be limited to one breed, so I adopted a smaller flock or unit, viz. 170 as a maximum. I think, however, if commencing again, I should choose the 200-bird flock as the most advantageous from every point of view.

The number of birds kept to the acre differs. On farms where the runs are ploughed yearly and sown down with forage crops, fully 400 are maintained year after year in health. My runs—or paddocks, I think they deserve to be called, on account of their size—are in grass, and after the most careful experimental work I feel now confident in saying 300 may safely be kept to the acre, that the scientifically treated pasture provides ample green food for this number, and that a smaller number would not be so economical.

Year after year the grass keeps perfectly healthy, and indicates that it only receives manure enough to maintain good growth. Of course, the character of the land and the good natural drainage probably have some bearing on this fact. Having ascertained this, fresh houses have been built, and a few have been pulled down and re-erected, in order that the lay-out should conform to the stocking of the land at the rate of 300 to the acre, in houses holding from 160 to 170 head each.[1]

The amount of floor space given to flocks on the semi-intensive system has been practically standardized at 4 square feet per bird. It is by no means a mistake to give a few over. The standard houses on this farm are

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[1] See concluding paragraphs in the last chapter.

50 ft. long by 14 ft. wide; they are fully 8 ft. high in front, and between 4 ft. 6 in. and 5 ft. high at back. If building again right through, I should make them 60 ft. long, in all other respects the same. I would, however, have the units all one size; and although for some time I have concluded that the standard house might well be 60 ft. long, because I commenced with the 50 ft. house I have continued to build it, as it would be most confusing to have units of varying size, and must work against ease, uniformity and efficiency in management.

Having given the dimensions of the houses, I will try and describe the construction in detail. Although timber is still about 100 per cent. over pre-war prices, it has fallen very considerably, and will probably fall more. I should recommend, therefore, that foreign timber should be used. The later houses on this farm have been built of this, but I use lighter stuff than formerly. A specification, with prices as at present, will follow. By this it will be seen that houses can now be built at £1 per foot run, allowing a reasonable amount for labour.

The material required is simple, and is as follows: 2 × 2 quartering, 2 × ¾ batten, a little 1 × ¾ batten, feather-edge boarding and plain ½ in. boarding and plasterers' laths.

I do not build expensive houses, but particularly bear in mind, when designing, that every part is to be easily replaceable. With the help of a handy labourer, the carpenter can turn out a house ready for occupation in fifteen days.

If a house is to be built, the following preparation is made a few days beforehand: the uprights are cut the right lengths for their positions; the ends to go in the ground are charred in a slow fire, and while hot are dipped in a mixture of tar, pitch and lime for about

2 ft. upwards—one gallon of tar to 2 lb. of pitch and 2 lb. of lime boiled up together.

Sufficient feather-edge boards are well dressed with the mixture on both sides to form a skirting, two boards high, all round the proposed house. The boards must be thoroughly dry and seasoned for this purpose, otherwise the treatment would set up dry rot. The right lengths and numbers in which to cut the uprights are given in the specification at the end of this chapter.

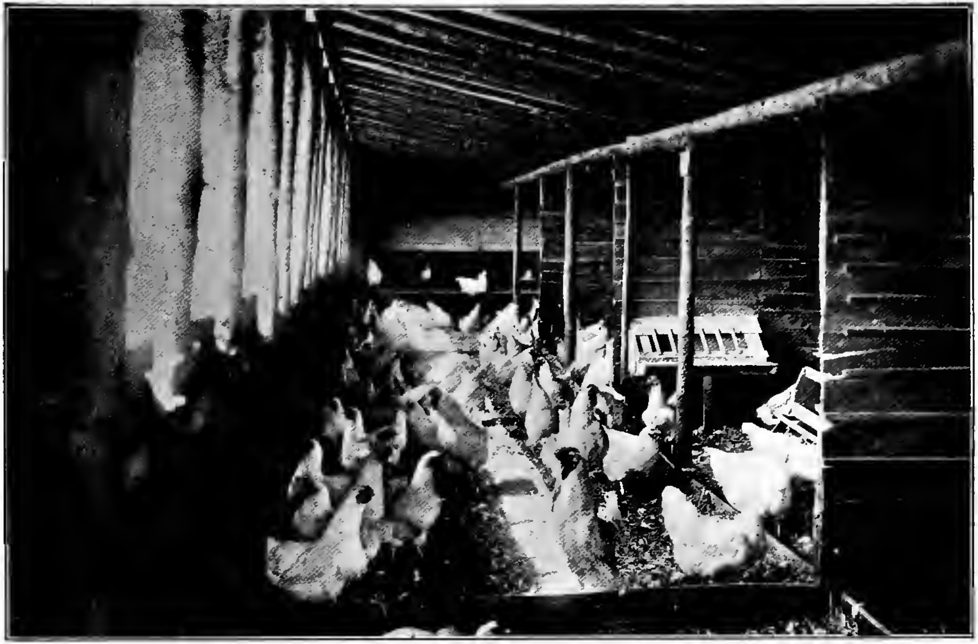
The two ends or sides are made first. They are built up independently while lying on the ground, a space being left in each for the doors. The uprights are all let into the ground to the depth of 4 or 5 in. The sides, when completed, are set up, carefully squared and set upright, the projecting quartering to which the boards are nailed dropping into the holes prepared for them. A line is carried from the highest point of one side to the highest point of the other; the lowest points are connected in the same way. Building proceeds, guided by the lines. The uprights, tarred ends downwards, are set in the holes prepared for them and rammed tight. As there are three stalls in each house, the back uprights are fixed so that three are in position to take the stalls, and one is placed so that it ultimately comes halfway between the stalls; these, with the two used for the making of the sides, complete the nine. In the same way two of the twenty-one used on the front are also needed for building the sides, from which everything starts. The four form the four corner posts. To stiffen these, four short pieces of 2 × 2, about 2 ft. long, also charred and tarred, are let into the ground and spiked with 4-in. nails to the four corner posts, so that these are 4 in. by 2 in. for a short distance above floor level. Four lines of 2 × 2 quartering, each 50 ft. long, are required to form the front plate, the back plate, and two lines of support running from end to end of the house to support the light rafters, which are simply 2 × ¾ slate batten. The 2 × 2 girders are supported every 5 ft., except in one section, by a 2 × 2 upright, or by the stall. Eighteen uprights are required.

In the first section, into which the door opens, only one upright is used in the first row for convenience' sake. The length of girder, to make up for the loss of the second support, is reinforced by a clean piece of 2 × ¾ being spiked to it. Eighteen uprights are used internally to support the light roof under a weight of snow; they also tie the roof down.

The roof is simply of good felt. It is laid in 3-ft. wide strips from the highest point to the lowest, starting from the lowest point of the hood; the hood and roof are all in one piece. The rafters, as said, are 2 × ¾ battens, obtained in 15-ft. lengths if possible; if not, the 15 ft. is made up of two lengths butted together and secured by a batten strap 18 in. long nailed on the under side. Each 3-ft. width of felt receives the support of three of the batten rafters. The felt is secured to each of the rafters by plasterers' laths and 1-in. wire nails. The framing of the hood is also formed of 2 × ¾ batten.

Each strip of felt is lapped 2½ in. by the adjoining strip. It is most important that the felt should be laid from the hood downwards, and not horizontally. Felt being 3 ft. wide, each strip, allowing for the lap, covers 2 ft. 9½ in. Eighteen lengths of felt, 17 ft. 6 in. long, are required for the roof of a 50 ft. × 14 ft. house. The laying of the felt must always commence at that end of the house that may be the lowest, if there is any difference. The line of plasterers' laths follows the line of the batten rafters,

PLATE IX.



THE INTERIOR OF ONE OF THE OLDER LAYING HOUSES.

The nest box on the extreme left has been removed and the second door fixed since the photograph was taken. A result of the hot summer of 1921.

To face p. 54.

and the wire nails are driven through the laths, felt, and into the batten; the felt is sandwiched between the two. The remaining tarred boards, some having been used for the sides, are nailed along the bottom of the back and front. To complete the framework for the back, a line of batten is nailed horizontally between the top plate and the boards to the back uprights. The plain boards are cut in 4 ft. lengths, and are nailed vertically to the top plate, the middle batten, and the bottom upper board. The back is finished by covering it with felt, fixed in vertical lengths and secured with laths and nails as for the roof. Feather-edge boards complete the front, rather over 4 ft. from ground level, the upper or last board being turned upside down to give a stout thickness to which to secure the wire-netting. The illustration will show that the boarding is carried from top to bottom for a short distance from each corner; 2 ft. 6 in. in the latest houses. The perches, 3 ft. long, are set at right angles to the back, over a manure pit, instead of the usual manure boards, which I greatly object to. The bottom of the pit is the concrete floor of the house, and the front is formed by nailing ½-in. boards a foot high to the uprights that carry the front rail, upon which the perches rest. The back rail is nailed to the back uprights. The perches are secured to the rails in the simplest way. A hole is bored in one end large enough to take the head of a 2½ in. wire nail, which is driven 1½ in. into the rail; another nail is driven opposite to it in the back rail. A fine slot is cut in the other end of the perch large enough to allow the shank only of the nail to slip through. The perches are quickly and easily moved, and no harbour is provided for the red mite pest.

The perches are set 15 in. apart, measuring from centre to centre. The perches, the perch rails, and their supports are all prepared out of the 2 × ¾ batten. The doors are constructed so that the part that corresponds with the panels of an ordinary door is removable in the form of a shutter. In summer this is taken out, and the wire-netting with which the frames of the doors are covered is exposed. The door can so be used as a solid door or a wire-netted door.

Extremes of temperature are very detrimental to egg production, great heat being far more lasting in its bad effects than cold. In order to keep the houses as cool as possible in very hot weather two doors are now available. These are placed opposite each other, one in each side, or end of the house, as near the front as possible; they can be used as solid doors or as wire-netting doors. The front space of the house, with the shutters removed from the doors, then becomes a cool corridor 50 feet long.

A broody cage 4 ft. long and 3 ft. 6 in. deep is placed on the rails that carry the perches; this has a barred front and side and barred bottom. For the bottom the bars should be not more than 1½ in. apart. The bars are formed of 1 in. by ¾ in. batten. The nest-boxes are 2 ft. square, or a little more, being large and roomy. Several hens can occupy one nest-box at once. Three are built on to the side of the house, about 15 in. from the floor; two are on the floor; two on the stall facing those on the side. The lids slant sharply and are movable. There is for the birds' convenience a 6-in. platform running along the front. The hopper in the photograph is for shell; no dry mash is fed now. The troughs for soft mash are movable, and are placed well back between the partitions. When they were in the foreground they proved a source of colds, as the birds roost on the top rail, and were then in a draught. The troughs are 10 ft. long, 6 in. wide over all, and 3 in. deep. They are supported on diagonal legs securely nailed and riveted to the ends. Short strips of batten riveted to the bottom of the trough support narrow perches 4 in. from the trough side, from which the birds feed. A rail runs along the top, 8 in. from the bottom of the trough; this keeps the birds out of the trough itself. Each house has its own corn store. This consists of three barrels either placed in a small open-fronted shed (see general view of the farm) or contained in a small enclosure formed of batten and wire-netting, which is just inside the house on the left-hand side of the door when entering. A store of shell is also contained in the house in a large box. Unless the houses are close to a natural supply of water, they are spouted, and the water led into tanks. Since the photographs were taken the tubs have been abolished and all replaced with tanks; these now hold upwards of a fortnight's supply. There are four water vessels; these are known in the trade as "wash-ups." They stand in a row outside the house. The birds drink, if inside the house, through slots 8 in. high by 2½ in. wide. A wooden flap works on hinges over the openings; this is closed down on cold winter nights.

There are recording cards in each house. Upon one side a daily record of the eggs collected is kept; on the other are columns for keeping a record of birds taken out and birds put in, and arranged so that at a glance the total number of the birds in the house can be seen.

The floors are of cement concrete. During the war, cement being almost unobtainable, a number of floors were made of lime concrete. The floors would have done very well if it had not been for the rats; these broke through the soft concrete and set up numerous colonies under the floor. All these floors have been broken down and floated over with a good concrete of cement and sand, with a few ashes. Lime and cement do not agree, and the admixture of lime renders the concrete too soft to withstand the depredations of the rat pest.

The best way to lay a concrete floor is to mix gravel—or hard clinkers will do—with a small proportion of cement. This must be thoroughly mixed with water and laid wet. The next day, float over with a rich mixture of sand and cement, about one cement to four of sand. A good floor is an important factor in a fixed poultry house, and it is a mistake to economize too much. The total thickness of the floor need not be more than 4 in., if the situation is dry; if damp, then it should be 6 in. above the outside level of the land. It is obvious that floating concrete all round the uprights renders all very rigid and strong. No wind can move the house; it would be blown to pieces first. Back ventilation is given to all the houses. In the one described, sufficient air enters under the felt at the back, as the battens, $\frac{3}{4}$ in. thick, raise the felt $\frac{3}{4}$ in. above the back plate. No glass is now used at all; the wire front admits plenty of light. The glass windows at one time fixed in the south-east side have been removed, as they caused the birds to congregate too thickly at one end of the house. For a wire-netted front as described, the hood should be 2 ft. 6 in. wide, and should be set at an angle just steep enough, but no more, to let the water run off comfortably; if too steep, it obstructs the light too much, and does not protect so well from driving rain. Several photographs are given, and their footnote describes whether the houses are of the newer type or not; but the newest one shown is not quite the same as described, as some larch uprights have been used, as well as those of ordinary quartering. Seasoned larch, if it is available, can be used, but it entails more labour in preparation, as they should be peeled; its drawback then is that when quite dry it cracks, and affords a good harbour for red mite. All larch fittings for perches have been removed in the houses on the farm and replaced with deal battens both for supports and the perches themselves. There are a few other houses on the farm other than the type in question: they are higher, deeper and shorter, their actual dimensions being 35 ft. long by 20 ft. wide, 9 ft. 6 in. high in front, 5 ft. at back. Their high fronts necessitate two hoods, the lower one of canvas on a frame. This is on hinges, and is closed down at night in winter. The lower half of the front, made of boards, has three large windows in it. These were the first large houses built. I prefer the longer, narrower houses, and they are cheaper to build.

The 50-ft. houses suit this sheltered valley very well; probably, if on high ground they would require a second hood, which when closed down would protect the lower part of the open front. With a second hood it would be necessary to have some windows in the boarded part of the front. A new house is first dressed with the mixture of tar, pitch and lime; they are afterwards tarred with plain tar. Three coats are given, and then once in two, or at least every three, years they should receive a fresh coat of tar.

In order to save labour in replacing the litter, baffle boards are set lengthways and across the house, as shown in the illustration; these are movable, as they are kept in position by the grooves into which they slide. In conclusion, I give in detail my objections to the manure boards under the perches which are so almost universally in use in modern poultry houses:

(1) Because they involve such an appalling amount of labour.

(2) Because, being placed as they must be, they hold the fresh manure close to the nostrils of the birds when at roost.

(3) They obstruct ventilation, and also compel the perches to be placed higher than they should be in the lean-to type of house.

(4) Owing to the birds having so small a space between them and the roof, it is impossible to employ back ventilation, which I have found essential in this valley, if the flocks were not to be decimated with roup every winter.

(5) They form ideal breeding places and harbour for the worst of insect vermin, the red mite.

The felt used is a 2-ply bitumen felt for the later houses, formerly a 3-ply asphalt felt. The former takes less tar than the latter, but is a little inclined to sweat in foggy weather.

A hole in a felt roof can be easily and quickly repaired. A patch of 1-ply bitumen felt should be cut several times larger than the hole; the surface of the felt round the hole must be dressed with a warm mixture of pitch and tar, the patch being dressed in the same way; the two dressed surfaces are placed together, and the patch well worked down on the surface of the roof with the brush, and also tarred on the upper surface. The corners of the patch should be trimmed off in the same way as with a patch put on a motor-car or bicycle tyre.

The houses are put together with wire nails; the sizes required are 4 in., 2½ in., 2 in., 1½ in., and 1 in. When necessary, these nails rivet well. Fine wire-netting is sunk in the ground all round the house, and the upper selvedge nailed to the same, to check rats burrowing under the floors.

SPECIFICATION OF MATERIAL REQUIRED FOR POULTRY HOUSE FOR 170 HEAD, AUGUST 1921.

50 FT. 14 FT. × 8 FT. × 4 FT. 6 IN.

		£	s.	d.
21 pieces 2×2 8 ft. 6 in.	179 ft. for front (two will form front corner posts).			
10 pieces 2×2 7 ft. 6 in.	75 ft. supports inside house.			
8 pieces 2×2 6 ft. 6 in.	52 ft. supports inside house.			
9 pieces 2×2 5 ft.	45 ft. back.			
12 pieces 2×2, average length 7 ft.	84 ft. sides (two will form back corner posts).			
200 2×2 plates	200 ft. plates and girders.			
Spurs, etc., 2×2 20 ft.	20 ft.			
	655 ft. at 2d.	5	9	0
7 squares feather-edge boarding	at 20s.	7	0	0
5 squares plain ½-in. boards	at 20s.	5	0	0
1,800 ft. 2×¾ battens	at 4s.	3	12	0
280 ft. 1×¾ battens	at 2s.	0	6	0
3 bundles plasterers' laths		0	18	0
7 bags (2 cwt.) cement	at £6 per ton	4	4	0
6 rolls felt 72 ft. long	at 26s.	7	16	0
Tar, nails, hinges, wire-netting for front and for sinking in ground round the house	*Estimated*	3	15	0
		£38	0	0

CHAPTER IX

THE GRASS RUNS AND PADDOCKS. THE SEMI-INTENSIVE COLONY SYSTEM

The better management of the land upon which the poultry range is more understood than formerly; in fact, in the old times, beyond moving the house in which the birds roosted to a fresh site in the same run, little or nothing was done in the way of maintaining the grass in a healthy condition.

By the use of soil disinfectants, scientific manuring, combined with large laying houses, we are now enabled to carry about two and a half times as many birds as formerly to the acre, and still maintain the turf in a much better condition.

As previously stated, the growing stock on this farm now all run on free range; the large house here again has rendered this economy possible. At one time I considered it necessary to supply each with its own enclosure, the old bugbear of overcrowding, which was the curse of the small colony house, being ever before me.

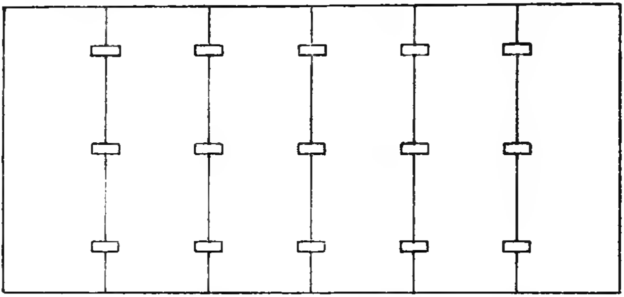
By degrees we found out between us that in the large house, whether used for young stock or adults, a kind of community was set up, and that, having once been established in a certain house, a bird very rarely changed the quarters in which it was accustomed to feed, to sleep, and to spend a large portion of its time. The habits of poultry have been changed: they live in their houses, using the outdoor ranges intermittently and for comparatively short periods.

When a flock of young birds are put in a fresh house they should be shut in for two nights before they are given liberty outside; having gone to roost twice, they will not leave their own quarters even if another similar large house is in their close neighbourhood. As the fencing is not necessary to prevent overcrowding and is also not required to secure the alternate use and rest which all poultry runs should have (the land used for young stock gets a long rest annually, as the young birds are drafted off), all fencing except the boundary fences has been removed. The abolition of fencing saves considerable labour and expense, for wire-netting and stakes are somewhat perishable articles.

In the field, however, given up to breeding and laying stock, where the flocks are permanently on the ground, and where the numbers of birds are very large, a certain amount of fencing is necessary. As in each of the six houses reserved for the breeding stock there is a different flock either of pure-breeds or crosses, each house has two runs, which are used alternately month by month. These runs are each a little over ¼ acre each, 3½ acres being reserved for the twelve. The 31 houses in which purely laying stock are kept have only 13 paddocks between them. As the land the layers occupy is over 16 acres, the paddocks average 1¼ acres each. The fencing is arranged so that each house is connected to two paddocks, so that the principle of alternate use and rest is maintained, the birds being changed over from one enclosure to another on the first day of each calendar month.

Like many things, it is all very simple when it has occurred to you. For the sake of illustration I will assume a 10-acre field is to be laid out for a flock of laying hens—not breeders; that 60-ft. × 14-ft. houses are to be used, each holding 200 hens. At 300 to the acre, 15 houses will be necessary. The field will contain 3,000. To provide each of these houses with two runs each, a very large quantity of fencing would be required, and when in position it will not exactly facilitate attending to the stock. On the system I am explaining a comparatively small amount is necessary, and getting about is easy and the labour is much reduced. A sketch will explain best, and why. For this method of managing flocks of poultry the Semi-intensive Colony System seems an appropriate name.

The boundary fence of course must be wire-netted, but if the hedge, if hedge it be, is kept carefully trimmed, 3-ft. netting placed close to it will suffice. I have chosen, of course, the most suitable shape of field, but the principle can be applied to any field. It may be necessary to run some of the fences diagonally, and odd corners may have to be specially provided for. A gateway, for convenience, should be placed both in front and behind each house.



With the exception of three or four runs used for pigs, and in the fences that divide the breeding stock from each other and the unmated layers, gates, in the ordinary sense, are not used, but simply openings are made in the wire-netting fence. The gate is the wire-netting itself. One end, the loose end, is secured round a stake pointed at one end so that it will grip the ground; the netting is bent round it, and secured top and bottom with a staple. The loose end closes up to another stake, and is secured by a loop of wire which drops over the "shutting to" post. A length of old chain is interlaced into the bottom selvedge of the length of netting that forms the gate. The openings are made 10 ft. wide, to take the horse-rake. It is as well to cut the wire-netting long enough, for the opening and closing tends to elongate the wire meshes in time, and the gate may become too short to close the opening. The gateway described can be seen in one of the photographs. If only one variety is kept the birds can be mated in such a section as is shown on the plan. It is not, however, to be recommended, as breeding flocks should be carefully selected. The fences that confine and divide breeding flocks must be 6 ft. high, and properly made gates must be then supplied, as the wire-netting gates are not suitable for netting more than 4 ft. high. The wire-netting used for the laying and unmated stock is only 3 ft. high. Sheep netting is used of 3 in. mesh and 16 gauge; it makes a strong, neat and durable fence, and is high enough to keep the flocks segregated, as in the large paddocks, with their wide range, very few birds fly over even a 3-ft. fence.

Very great importance is attached to the treatment of the grass itself, and a special treatment is given to the bare spaces round the houses, where the birds congregate most.

Each time a house is cleaned out, which is once in six months, the bare land round the house is treated with either lime or salt. The lime is given for six months in the year, from September to March, viz. during the coolest and dampest period; the salt, from March to August. During these periods each house is cleaned out twice; for safety's sake, as salt is an avian poison, the salt is given in solution; it is dissolved in water in a cast-iron copper at the rate of 1 lb. to the gallon of water, and applied with a watering-pot; 40 lb. of common agricultural salt is the quantity used each time. By this treatment I think the land becomes sterilized and unfit for the propagation of disease germs; anyway, after the salt application the worms come up to the surface in numbers and quickly die. In addition, each autumn the whole of the land, both bare land and grass land, is dressed with basic slag; 4 cwt. for each house is allowed, or at the rate of 7 to 8 cwt. to the acre.

In summer the land round the houses is swept up, in winter both scraped and swept. What is removed is replaced with clinkers. There has been no epidemic on the farm for ten years, viz. since these precautions, coupled with the other forms of disinfection, have been employed. The latter will be described later. The grass grows freely, necessitating two mowings yearly, which are made into hay. The large size of the enclosures enables a horse-mower to be used with a horse-rake. At one time sheep grazed the aftermath; they were, however, a nuisance, and did a good deal of damage to the fencing. Mowing is considered preferable.

The combination of slag with poultry manure seems to be exactly what is required to promote the growth of a fine grass, which is the best of all green foods, and the one poultry prefer to any other.

I am much indebted to Mr. G. A. Palmer, of Wykin, Leicestershire, for valuable hints on the management of grass land for poultry.

NOTE.—See concluding remarks with last chapter.

CHAPTER X

THE FOODS AND FEEDING FOR 6,000 LAYING HENS

The foods fed to laying hens and ducks are the raw material from which eggs are produced, and unless these are of the right character, profitable production cannot be; and unless this raw material is bought well, profits must be prejudiced, even if they do not disappear altogether. Poultry keeping, in all its branches, is, up to the present, largely the business of the amateur. Too many have concentrated all their attention on the successful management of their poultry, forgetting that the buying of the food which laying hens consume in such large quantities is quite as important a factor in the economy of poultry culture as good technical management. The poultry farmer on a considerable scale should be in a position to buy in bulk; if he is not, then I am afraid the prospects for his commercial success are very poor. He cannot afford, any more than any other wholesale producer, to buy his raw material at retail prices and sell his own products at wholesale prices.

A knowledge of the commercial value of feeding stuffs is not difficult to acquire, as the market values are published weekly in the Poultry Press, and this knowledge can be supplemented by taking in one of the corn trade papers. As to how to feed and what to feed is a different matter; some of us who are in a position, it would seem, to know most about this recognize that at present there has been no real research into the best way to feed the hen, of a scientific nature, such as has been the case with our other domestic animals. We can give our views, which are based on practical experience, and the knowledge we have of the general characteristics of feeding stuffs, but we cannot be sure if these systems of feeding are the best, in the way of being the most economical from every point of view. The large poultry farmer should be in a position to buy in bulk, viz. in tons, not in hundredweights. The poultry keeper may buy nearly as advantageously, if he will co-operate with his fellows. I will indicate the foods that I think myself are the most suitable. They are staple foods, generally plentiful, and not expensive. For mashes: middlings, maize meal and the by-products of maize, such as maize gluten meal and maize germ meal, with good fish meal, properly proportioned, will constitute a good mixture alone; some dried yeast and feed oatmeal will be an improvement, if added. Feed oatmeal is a by-product of oatmeal milling, as middlings are of wheaten flour manufacture. Dried yeast is a tonic and digestive, and is also rich in albuminoids, some 40 per cent. The proportion in which these are blended, and the way they are diluted on this farm, is given later.

Sussex ground oats are a good food, but being also dear one, I do not use them or biscuit meal, for the same reason.

I used coconut-cake meal for years, but lately maize gluten meal has taken its place, because I have an impression the latter should be more digestible, the former being prepared from the coconut and the latter from a cereal.

So much is demanded from the laying hen that it would seem desirable to use, as far as our knowledge goes, foods that have the character of being easily digested and are on the average cheap and easily obtained. Wet mash only is fed—it is given as the first feed of the day—on six days a week; on Sunday morning the birds receive a feed of 2 oz. of corn, which consists of half good wheat and half round maize; this is a change from the ordinary corn ration.

The mixture of dry meals used for the mash is as follows: 8 cwt. middlings, 2 cwt. feed oatmeal, 2 cwt. maize meal, 3 cwt. gluten meal, 1 cwt. dried yeast, 4 cwt. fish meal—total = 20 cwt. When in full production the birds consume about 3 oz. of wet mash each; this is made up of 1 oz. of the dry concentrated meals, and the balance of cooked vegetables and the liquor they are boiled in, which is absorbed by the dry meals.

When resting in the autumn, the consumption of mash falls off as compared with the amount consumed at the height of production. This system of feeding a large proportion of cooked vegetables was developed during the war, to economize in the use of cereal meals, which were then so dear and scarce. The results, both as regards production, the health of the stock and economy, were so excellent that it has been continued ever since. The vegetables are cooked in coppers or boilers. They should be simmered rather than boiled, and should only be cooked sufficiently to allow them to be comfortably blended with the meals. The vegetables and the liquid they are cooked in, the maize products, dried yeast and fish meal, are worked up together in the mash-tubs with long wooden mixers, made out of a strip cut from inch boards; they are about 2 to 3 in. wide. This work is done in the afternoon. The mixture is covered some inches deep with middlings and feed oatmeal, which exclude the air, and the mash remains warm till the next morning, when the whole is worked up into a crumbly condition with the middlings and oatmeal. Once a week, as the mash is prepared, flowers of sulphur, at the rate of 1 lb. per 1,000 birds, is added. The principle followed in feeding vegetables is to use about half roots, such as kohlrabi, artichokes, mangolds, turnips and swedes, and half greens of the cabbage tribe, rape and various kinds of cabbage, according to the season. Further particulars of the rotation of crops are given in another chapter. To facilitate cooking, the roots are first passed through a pulper and the green stuff through a chaff-cutter. A certain amount of the latter is mixed in the mash raw.

The feeding of the mash occupies the first one and a half hours of the day; then the feed of corn is given in the litter; this is at the rate of about ½ oz. per bird. This is called the scratch feed, and consists generally of wheat screenings and a little cracked maize. The giving of this feed affords the leading poultrymen an opportunity to observe how the birds are eating the mash. The birds feed intermittently all the morning on the corn in the litter, which they have to work for, and the mash in the troughs. Enough of the latter is given to last for several hours. Birds are intermittent feeders naturally, and poultry are no exception, if given the opportunity. I can only give the amounts of the average consumption of food. One of the most important, if not the most important art that a good poultryman must acquire is to learn how to feed, and so vary the amounts fed to suit the condition of his charges.

I always tell my head men that the whole success of the undertaking depends upon the skill with which the feeding of the layers is carried out. About 2 oz. per bird of oats and maize are fed in the litter in the afternoon. The standard mixture of corn is as follows: 1½ cwt. wheat screenings, 1½ cwt. good oats, 2 cwt. cracked maize. Each house is self-supplying in the way of corn, and the grains are kept separate in three tubs. The above is the mixture used for about eight or nine months in the year. During the cold winter months the proportion of maize is increased. The mixture then used is 1½ cwt. wheat screenings, 1½ cwt. oats, 2 cwt. cracked maize, and 2 cwt. round whole maize. We think during the winter months it is much best to use some whole maize in the last feed, as this is more slowly digested, and therefore affords a greater stay to the birds through the long winter nights. A large proportion of the poultry are very fond of whole maize, and are therefore induced to fill their crops to the utmost before going to roost. When whole maize is fed at night, the Sunday morning feed consists of good whole wheat only. It will be seen that for the greater part of the year the corn ration consists of two parts maize to three parts of the lighter grains: but during the winter the proportion of maize is as four to three. The skill in feeding mainly lies in giving the right proportion of mash.

The appetites of the birds require very carful watching in this respect, as when about to lay, or laying, they will eat large amounts of the mash; but when resting they will not, and, in fact, it seems almost repulsive to them; just as is the case with worms: these will be eaten greedily when the birds are laying, but altogether disregarded when they are not laying. A large number of commercial poultry farmers feed dry mashes. It will generally be found, I think, that they keep White Leghorns. During the war, in order to save labour, I fed dry mashes for six months, but with disastrous results as far as the production of eggs was concerned. I reverted then to wet mashes, and certainly have no intention of ever trying dry mashes again. I found that White Leghorns, which are in a minority on this farm, did less badly on dry mashes than my general purpose breeds. It appears to me that the saving of labour in feeding dry mashes is negligible, if fresh dry mashes are fed daily, as they no doubt should be. Meals exposed to the air soon lose their aroma and freshness, and they must soon become more or less contaminated with the dust raised in the scratching shed.

If laying stock are to be fed on dry mash, then there is no doubt they should also be reared upon it. The meals I have mentioned as being the standard mixture used are concentrated. It is necessary they should be so, as they are diluted with the cooked vegetables. It appears to me that such a mixture of concentrated meals and vegetables is a cheaper system of feeding than any system of dry-mash feeding can well be. Dry mashes are rendered bulky by the addition of bran and clover meals. I do not use clover meal, as I have not thought it necessary or even desirable, when taking into consideration the facts that the birds here always have access to plenty of grass and that raw vegetables are used in the wet mash as well as cooked. Much of the clover meal of commerce can, I think, be of little value as a food, as it often consists of the refuse of threshing machines and of chaff-cutters. To be of real value the clover must be most carefully cured and prepared. Ordinary clover hay, as it is heated in the stack, would not, I should think, be of any use at all. The genuine article would probably be valuable to those who during the winter months, or at any other time, are unable to obtain green food. As the hen's digestive tract is short, and digestion is rapid, coarse fibrous foods such as malt culms, brewer's grains and common clover meals should be avoided. Another argument in favour of wet mash is that an egg contains some 70 per cent. of water, and it must be surely better to supply some of this in the food, rather than to force laying hens to drink an excessive amount of water. An egg contains 10 per cent of fat. Maize is a food particularly suitable for supplying fat. Generally there is a growing tendency to favour a wide ration rather than a too narrow one. It is well to remember that the hen, unlike the cow, will not produce until her own bodily wants are supplied. The cow will almost starve herself to give some milk; the hen, wisely, is not so generous. Fish meal is a very valuable factor in the diet of the laying hen, but owing to its great richness in albuminoids it must be used with discretion. Some authorities attribute the tendency to kidney disease, which seems on the increase, to feeding too large a proportion of fish meal in the ration.

I will now give a general repetition of the system of feeding. The corn feed amounts to 2½ oz. daily per bird, with 3½ oz. on Sunday. These rations are constant, and are fed regularly throughout the year.

It seems to me better to have the corn ration constant, as the birds will always eat this, rather than by cutting down the corn to try to force them to eat a food which, owing to their condition, may be objectionable. The mash is regulated to meet their appetites. They will eat it fast enough when laying or about to lay; it is up to the feeders to respond quickly to any indication on the part of their charges that they are asking for more. This is where skill and observation come in on the part of the feeder. A general knowledge of feeding stuffs must be acquired. It is particularly necessary to be careful in buying fish meal, for unless made from fresh white fish it is a dangerous food. The analysis is about as follows: 56 to 58 per cent. of albuminoids, 15 to 17 of phosphates of lime, 3 to 4 per cent. of oil, not more than 4 per cent. of salt. Salt is an avian poison if given in excess. I think the salt in fish meal and in shell supplies all the salt poultry require. The phosphates of lime are a particularly valuable factor in egg production. Several firms make a speciality of preparing fish meal for poultry and pigs, and will give the necessary guarantees. Mr. G. A. Palmer, of Wykin, Hinckley, Leicestershire, one of these firms, was the pioneer in introducing fish meal as a valuable food for poultry. Fish meal is also fed to pigs. According to the Ministry of Agriculture 1 lb. per day for adult pigs is the right amount. I have found it particularly good for breeding sows, and enables their diet to consist largely of vegetables.

Maize is, in my opinion, one of the most valuable of grains for poultry, providing it is fed with judgment according to the seasons, and is balanced with other food and cereals, such as oats and wheat screenings. I should not feed it as a regular thing in conjunction with sound wheat. When it forms a considerable item in the diet, I prefer to feed a proportion of it cracked or kibbled, but I believe whole round maize is very useful for helping laying stock through the long nights of the colder months. I myself always use flat American or South African flat maize as kibbled maize; it is cheaper generally, and I think more digestible, and certainly more palatable to the fowls, than the more steely round maize. Kibbled flat maize will become soft, when damped, more rapidly than round maize when kibbled. Young stock will quickly take to kibbled flat maize, whereas there is a difficulty in getting them on to the other.

Four broods of chickens hatched in stolen nests, and brought up by the hens very roughly, during the late autumn, were fed largely on kibbled flat maize, just as it was broken for the laying stock. They have grown very well. They had wheat screenings besides, and once a day a little of the soft food fed to the hens amongst whom they lived.

The public, however, object to kibbled flat maize, preferring the round variety even when kibbled, I suppose because it is white rather than yellow. Another reason, probably, is because the husk or envelope of the grain is easily detached and shows up in the broken maize. It is rejected by the poultry, and therefore gives rise to an impression of wastefulness. The cuticle of the round maize is so firmly attached to the grain that it remains attached to the broken pieces of maize. As a manufacturer of poultry foods, I know how often popular prejudice stands in its own light in the economical feeding of poultry.

As wholesale firms are not in touch with the consumers, we have to make what the dealers find the public ask for.

Sussex ground oats and biscuit meals are, of course, good and wholesome foods; they are not included in the schedule of foods consumed on this farm, as their price precludes us from using them. The cost of manufacturing these foods must always be heavy. As previously stated, a high-grade chicken biscuit meal is used for chickens for the first few weeks of their life.

Middlings, known by various local names, such as toppings, dan, thirds, sharps, etc., are one of the most indispensable of the foods used for feeding both poultry and pigs.

The middlings used are those known in the trade as "straight-run middlings." The explanation is that the coarse and fine middlings are run together instead of being sold separately. In making flour the two products can be either taken off together in one sack or separately. Straight middlings are in the best form for food.

Sometimes the germ is included, sometimes not, as it can be extracted and sold separately. It is used in the manufacture of flour for certain patent bread. As the germ is very nutritious, middlings are depreciated by its absence; the proportion is, however, small. It can be detected even by the naked eye, and appears in the form of small yellow wafers; into this shape it is compressed by the roller mill.

It is the general practice of English mills to sell their middlings run together.

I never use bran, partly because it is not good enough, I think, to use in conjunction with the large proportion of vegetables in the mash, but especially because its loose bulky nature allows air to enter the mash, and it consequently turns sour. If mashes are partly prepared one day to be used the next, air must be excluded. Bran is considered a valuable constituent of dry mashes. Oats are a very valuable food indeed, and go very well with maize. I use the English winter oats, clipped Canadian oats, and clipped Plate or Argentine oats. The public will not use two of these, the winter oats and the Plate oats, as they have grey skins. If we use them even in our poultry mixtures they become unsaleable; they are, all the same, good oats, much better, indeed, than some of the large white thick-skinned oats that are so popular. I slightly prefer the Canadian oats myself, of the three mentioned, but buy whatever are available and cheapest. Good oats should be thin-skinned and feel hard in the hand when squeezed, and are better clipped, as poultry do not like the tails; they can also fill their crops better with clipped oats.

Barley I never use; it is not much liked by poultry, and has not a good reputation as a grain for poultry. The wheat screenings are a product from the wheat cleaning machinery of the flour mills. Relatively, as a rule, these screenings are very dear when compared with sound corn, but there is something about them that poultry like, and we always think they do better when they constitute part of the corn ration. They mainly consist of very small thin grains of wheat, with various weed seeds and foreign matter. In an ordinary way they are ground up in the mills as made, and after being separated into coarse and fine grades, pass into the bran and middlings respectively, the proportion being very small. I have now given a résumé of all the feeding on the farm, both for chickens, growing birds and layers.

The subject of feeding all livestock is a very large one; much is still obscure. The feeding of poultry is simple enough, if the well-known and well-tried feeding stuffs are adhered to. There are other foods that may be fed to poultry—palm-nut meal, etc. I have my doubts about them, and so do not use them; and as the foods I have mentioned appear to me safe, and are always available, I do not care to experiment in using foods that may be cheaper than those I have recommended, in money values, but might prove very dear if they affected adversely either health or production. As an exception, rice-bran, or the inner skin on rice, which is removed when rice is polished, is probably a valuable food, as it is now very cheap. I am using a proportion. In appearance it is like fine dark middlings.

I think the system of feeding is as near to nature as the circumstances allow, and that the large proportion of vegetables, both cooked and raw, that is used helps to maintain both health and production, and certainly reduces considerably the cost of feeding.

Flint grit is not given to the adult stock, but a mixture of shell and a substance called "Calcomar"—four parts of cockleshell to one of "Calcomar." What the latter is I don't quite know; it looks like one of the limestone grits.

At one time both flint grit and charcoal were before the birds, but as they refused to touch them, they have been discontinued. The above mixture seems to answer very well, the shells of the eggs being sound and soft-shelled eggs rare. Although the laying hens seem to have no craving for flint grit, the chickens eat considerable quantities of a fine flint grit. The summary of the costs of feeding follows.

The following costs are calculated on the cost of feeding stuffs actually prevailing in the autumn of 1921. These are the feeding costs for the 6,000 laying hens only. They are intended to give the average amounts consumed per week throughout the year.

MEALS CONSUMED PER WEEK.

			£	s.	d.
8	cwt.	middlings at 11s.	4	8	0
2	,,	feed oatmeal at 11s. 6d.	1	3	0
2	,,	maize meal at 9s. 6d.	0	19	0
3	,,	gluten meal at 10s. 6d.	1	11	6
1	,,	dried yeast at 14s.	0	14	0
4	,,	fish meal at 20s.	4	0	0
20	cwt.	Average cost 12s. 9¼d. per cwt. ..	12	15	6

MIXTURE OF CORN USED.

			£	s.	d.
½	cwt.	wheat screenings at 10s.	0	15	0
1½	,,	oats at 10s. 6d.	0	15	9
2	,,	cracked maize at 9s. 3d.	0	18	6
5	cwt.	Average cost at 9s. 10¼d. per cwt.	2	9	3

CORN CONSUMED PER WEEK.

	£	s.	d.
67 cwt. at 9s. 10½d.	33	0	3

MEALS AND CORN CONSUMED.

	£	s.	d.
Meals	12	15	6
Corn	33	0	3
	45	15	9

The actual corn consumed works out at 20 oz. per bird per week; only corn is fed on Sunday.

The meals work out at 1 oz. per bird per day for six days a week.

Approximately 1 oz. of cooked vegetables is also consumed per day per bird for six days a week.

Estimating the costs of the vegetables on the basis of the increased expenses incurred by growing vegetables, or, in other words, by calculating what would be saved if the growing of vegetables was discontinued, the cost of growing them works out at 0·10 of a penny per week, or roughly 5d. a year per bird.

On the above calculations, the cost of feeding one bird for one week is as follows:

	d.
Corn, 20 oz.	1·32
Meals, 6 oz.	0·51
Vegetables, 6 oz.	0·10
	1·93

Or a small fraction under 2d. per bird per week. The mixture of meals, with the addition of a little bran, should make a good dry mash.

CHAPTER XI

THE GENERAL MANAGEMENT OF THE FLOCKS

THE permanent staff consists of ten persons, in addition to myself, who is the general manager and organizer. Two men and a lad are engaged with hatching, rearing and the care of young stock up to the time they are drafted into their permanent quarters in the laying houses or are sold for the table as cockerels. One of these men is particularly responsible for hatching and the care of the chickens in the coops or first stage of rearing. The other man takes particular charge of the chickens in the cold brooders and chicken houses. Both men, however, work together and assist each other. Each has either a lad or a pupil to assist him during the busy season, a temporary hand being engaged if necessary. The work with the young stock must vary considerably. Beginning with the first hens set in December, it gradually increases until the climax is reached in April; then, with the cessation of hatching in May, it gradually declines. The last chickens leave the brooders about the end of July. The holidays for the staff commence then, and one or two are away through August and September. As the young stock get collected into the houses for growing stock, the coops, brooders and chicken houses become vacant, and the land gets a complete rest. During the autumn the rearers have time to spare to help the other departments; one perhaps assists the carpenter—or handy man he should be called, as his work is by no means confined to working in wood only. At any rate, there is always something doing. The cultivated land will find occupation for anyone who can be spared. Later on the whole chicken plant has to be cleaned, sprayed and prepared for the coming season. A few pullets are on hand to early in the new year. The routine of work for the four poultrymen in charge of the laying stock is more constant, and is only varied by the fact that there are a good many more eggs to be collected at one time in the year than in another. The first job of the day is to water and feed the soft food, to do which takes about an hour and a half. There are, when the complement of birds is at its maximum, 6,200 head in the 37 houses. The feeding of soft food is not therefore such a long and arduous task as is often implied by those who feed dry mashes. It seems to me that the first part of the working day is more profitably spent in feeding soft food than it would be in cleaning down half a mile of manure boards, which would be about the length of mine, if I were, as I think, unwise enough to use them. As I have said before, the farm, as to the layers, is in two sections, half the birds being in charge of one poultryman, half under another. These two feed the scratch feed in the litter as soon as the soft food has been distributed, using the opportunity to observe how the birds are feeding. Everything depends upon the correct feeding of the flocks: the food must be reduced and increased as the occasion warrants. I am personally always more anxious about the risk of under-feeding large flocks than of over-feeding, the general tendency being to over-feed small flocks and to under-feed large ones. The other two men gather the vegetables, which are grown on a strip of land lying alongside the layers' field. If it is the day before the one on which a house is to be cleaned out, they gather a double supply to ease the work for the next day. The vegetables are pulped or chaffed, put in the coppers and the fires lighted. The whole staff then get on with any other work, such as disinfecting the houses. Every house is sprinkled with Izal disinfecting powder each fortnight, one section of the laying houses being done one week, one the next. Or it may be fresh litter is wanted in some houses, or litter requires turning and arranging. Pullets are perhaps fetched from the young stock plant, or the flocks are looked through for culls. There is always something to be done out of the ordinary routine of feeding and egg collecting on those days on which a laying house is not cleaned out. Three houses are cleaned out completely each fortnight, two one week, one the next. By never omitting to do this, the whole of the laying houses are cleaned out every six months. It is one of the advantages of having a moderately sized standard house that the job can be completed as part of one day's work. The house is completely cleaned out, thoroughly overhauled, the movable parts taken down, cleaned and disinfected. The floor and sides and all internal fixtures are sprayed with the disinfectant of half paraffin and half water-gas oil. The floor is covered with a thin layer of dry ashes : over these a pailful of Izal powder is sprinkled. The impression at the finish is that lice, red mite and the unseen microbes must have had a bad time. Finally, a thick layer of straw is spread on the scratching floor. A fine day is chosen, as the birds spend a day outside, at least for the four or five hours occupied by the cleaning. They always have the appearance of being not surprised at the disturbance, and

PLATE X.

A GENERAL VIEW OF PART OF THE FARM.

To face p. 82.

creep in and out of the house to lay as usual. The nests are dealt with first, and renovated as soon as possible. The house is not cleaned again for six months. The manure lies undisturbed in the pit, but each fortnight a sprinkling of Izal powder is scattered over the whole of the scratching floor and the perches and manure pit.

The main corn feed is given directly after the men's dinner. The eggs are collected and entered up on the collecting sheets handed to the poultrymen daily. I will, however, go into this part of the work more closely in a succeeding chapter.

Another job for the afternoon is to prepare the mashes for the next morning. How this is done is described in the chapter on "Foods and Feeding."

The day's work commences at 7.30 a.m. for all of us, breakfast being had before work begins. The dinner-hour is from 12.30 to 1.30, and the general work finishes at 5.30 p.m. These are the hours for five days a week. On Saturday the general work ceases at 12.30 p.m. As a rule, half the staff are off one week-end, half the next, only necessary work being done on Saturday afternoon and Sunday. The work is lightened in the laying field by feeding corn on Sunday morning, this feed being of a different grain to the standard rations. The evening work is the necessary closing down of houses, coops and brooders; this work is done in turn.

There is always work for the man in charge of repairs. I personally supervise these, as I attach very great importance indeed to keeping everything in thoroughly good repair; also to having the whole plant tarred at regular intervals, and to keeping the whole place clean and tidy. I nearly always, when doing the rounds, carry in my pocket a light hammer, pincers and a flat case of wire nails and staples, and do many a small repair in this way.

The proper cultivation of the land, the care of the breeding herd of four sows with their young and the fat pigs are in charge of one man; he also manages the flock of ducks. He necessarily receives assistance from other members of the staff whenever they can spare time from their own particular job.

The lady storekeeper's position is a responsible one, as all the sales of eggs and poultry pass through her hands. She also keeps the books and records and writes letters.

The laying flocks are regularly culled throughout the year. The old-fashioned plan of culling the two-year-old birds, regardless of whether they are fit or unfit, has long been given up. We have no actual means of knowing how old the birds are; this is so purposely, because I would rather trust to the unbiased judgment of the cullers and my own, in taking out birds that by their appearance indicate they are no longer profitable members of the feathered community. Some birds grow old sooner than others, some are not the right type, others get too fat, some become unhealthy. It is, as in everything else, a matter for judgment. A man becomes with practice, if he is of the right capacity, a judge of a hen, just as he might with the necessary experience become a good judge of a horse, a cow or a pig. For age we only cull in the autumn; in the other seasons we take out wasters only, viz. birds that are not so healthy as they should be. We require 2,500 pullets and ducks annually to keep the flocks in a profitable condition, both as regards quality and numbers. The first drafts are taken from the young stock houses in early June, and we continue at frequent intervals to draw pullets from the reserves up to February in the next year, 300 being reserved to take the place of the hens withdrawn from the laying houses for hatching and rearing. The first cockerels are sold in May as spring chickens and the last about November ; these are trough-fed in the fattening cages to finish them off for about a fortnight.

In November the breeding stock in the six houses are carefully culled : birds not considered good enough are withdrawn, but they may very probably be drafted into the laying flocks if they have the appearance that indicates they may still be profitable as egg producers. If it is necessary to move a whole flock for any reason, the birds are now driven, and not caught. Poultry, like pigs, are difficult to drive, but with care they can be changed from one house to another in this way, and they are far less likely to stop laying than if they are handled. We had to relay the floors of a good many houses, as mentioned in Chapter VIII. For this purpose the house had to be vacant for a week ; extra perches and extra nests were put between the stalls in a house near by, and the unit of birds was slowly and carefully driven from the house to be repaired into the house with the double set of perches and nests. This involved running a double unit in one house ; even then there was over 2 square feet per bird floor space. In the old times, on the extensive system, 2 square feet per bird was considered quite the correct thing. It requires some seven or eight drivers to move a flock of 150 head. The birds' own attendants carefully drive them out of the house to be vacated, then with light boughs in their hands or a stick with a rag on it, all, in a half circle, keeping close together, slowly and gently move the birds forward. We have driven them in this way as far as

200 to 300 yards. A very few may break back; these must be caught and carried.

Laying poultry should be kept as quiet as possible; they are very sensitive to strangers, and fully recognize their own attendants. Strangers should be kept off the laying side of the farm as much as possible. The very heavy yield of eggs often obtained by private poultry keepers may, I think, be partly attributed to the tameness of the birds, which are often treated and regarded as pets.

Most average people are capable of learning how to manage poultry successfully, providing they are fond of the work. It is futile to attempt to try and teach those who only look upon the industry as a means of livelihood; but there is one particular, and a very important one too, which is not every man's job, even if he is in other respects a good poultryman. I am referring to selection, to the culling of the unfit and the selecting of the best for breeding. Any reader of the scientific Poultry Press will realize what wide differences of opinion exist among the experts as to how to distinguish the points of a good layer, either by sight or handling. The truth is, I think, that the most experienced, and those who have a natural aptitude for the work, can only select in a theoretical sort of a way. There are certain points that are indications, no more and no less, that the bird that possesses them will prove a good layer. Among those I should place prominently are a fine head—" a nice picked head," as one of my old poultrymen calls it—medium size, width between the legs, tight plumage, and a general impression of a wedge-shaped body, fine in front, broad behind. The eye of a bird in good health and likely to be productive is generally bold and full, a shrunken, wrinkled eye being often a sign of old age. Still, as birds vary so in appearance according to the condition they are in, other factors must be taken into consideration before determining whether a bird should be culled as too old for future profit. The condition of the legs and feet is an important indication of age. The scales on the legs of an old bird are prominent and coarse, the claws of the foot bear signs of age and wear. All these points must be considered together before an opinion is formed, and then it is only an opinion. Experimental work has done a good deal to demonstrate that the idea formed by some of us of it being a profound mistake to cull all birds after they have passed their second laying season is a sound one. I came to this conclusion several years ago. I found that after the autumnal culling of all the two-and-a-half-year-old birds, and their replacement with pullets, there was a heavy drop in the egg yield, and a period of loss ensued regularly. Now we expect to, and do get through the bad months of October, November and December with a small profit rather than a loss.

It is no doubt true that the average bird lays more eggs in her pullet year than any other, but I do not think it is logical to conclude that because egg production drops in the second season it will drop still further in the third or even fourth year of a good hen of a sound and vigorous constitution. It is quite possible that the exhaustion of heavy production in the first year may be compensated by a lower production in the second year, and that production may again increase in the third and fourth years. Personally, I believe hens do give sometimes a profitable yield in their fifth year. In all our calculations we have to take into consideration the cost of the replacements, which is heavy, and also the fact that the more replacements that are required the larger must be the proportion of land, appliances and labour devoted to work which is not directly profitable, with a smaller proportion of land, appliances and labour devoted to the directly profitable work.

If this farm was worked on half pullets and half second-season birds, there would have to be a considerable reduction in the number of layers kept; and taking into consideration the high death-rate that exists in laying flocks, the necessity of culling birds that are either not naturally productive or that develop weakness from the strain they are subjected to, there must be more pullets bred considerably, which would mean more land, more appliances, more labour for young stock and a smaller number of layers. The death-rate on this system is no doubt higher ; some birds die worn out, practically in harness as it were, but I think, if careful records were kept, as is the case on this farm, it would be found that the death-rate amongst laying poultry is high, and probably will be so, even if stamina is increased by the introduction on commercial farms of the first cross, or possibly the second cross as well. My records indicate that a chart would show a death-rate line gradually rising as production increased, reaching its highest point after production had reached its highest, and continuing to fall, with slight variations, until production had reached its minimum, about the end of October or in the early part of November. The point of production with a mild open season reaches its highest towards the end of March ; with wintry weather in early spring it may be delayed until as late as April 14. From the highest point, production falls gradually through May, often remains stationary through June ; from July it gradually falls, till the minimum is reached at the end of October or in early November. There is usually a sharp rise about the middle of February.

Reverting to culling, it is as well when looking through the flocks to watch for any cocky hens. It is assumed that with the atrophy of the egg organs hens take on some of the external characteristics of the cock, in the form of a cock's comb and wattles. The position of the pelvic bones will be some kind of guide; if they are so close together that only one finger can lie between them and the bird has still a bright red cocky comb, it is almost certain that she is unproductive. By putting her in a small pen for a few days the test will be complete, if no eggs are laid. It is possible that birds are hatched as hermaphrodites, but it is generally assumed that these cases occur through breakdown of the ovary.

Putting the death-rate at 10 per cent. per annum of the whole flock, which is not unduly high by any means, and allowing for the withdrawal of birds which, though comparatively young, appear to be no longer likely to prove profitable, it is easy to understand that 2,500 head of young stock per annum will be required to keep a total of 6,400 adults, of which less than 100 are males, in profitable condition.

CHAPTER XII

VERMIN

A POULTRY farmer may make up his mind that, as long as he is one, he must wage a continuous war on vermin, both insect and animal. The opportunities are always there. Insect vermin will otherwise sap the life of his stock, and the vermin of a larger variety will destroy his property by day and night.

Of the insect species, red mite is by far the worst, and the most difficult to cope with. I heard of an Irishman being so disgusted with the difficulty of freeing a house from red mite that in his wrath he burned the house down; this drastic remedy no doubt achieved the object he had at heart, but it is not one many of us can afford. Still, I can understand his feelings. The Izal powder we regularly sprinkle the nest boxes and litter with seems to keep the houses free of lice, and also of the parasite that is the cause of scaly leg, but something much more severe is necessary to kill red mites. Neat paraffin, strong solutions of crude carbolic and water, and water-gas oil are the three remedies we have found effective. During the hot, dry summer of 1921 the red mite pest was particularly active. We used a mixture of paraffin and water-gas oil, and made it a rule to paint all perches and perch rails once a fortnight. They, however, are also found elsewhere, and if allowed to multiply will infest every portion of the house. During that summer, the worst I ever remember for insect pests, it was one continuous effort to keep the red mite in subjection; it must be done, or in the end they would eat the birds alive.

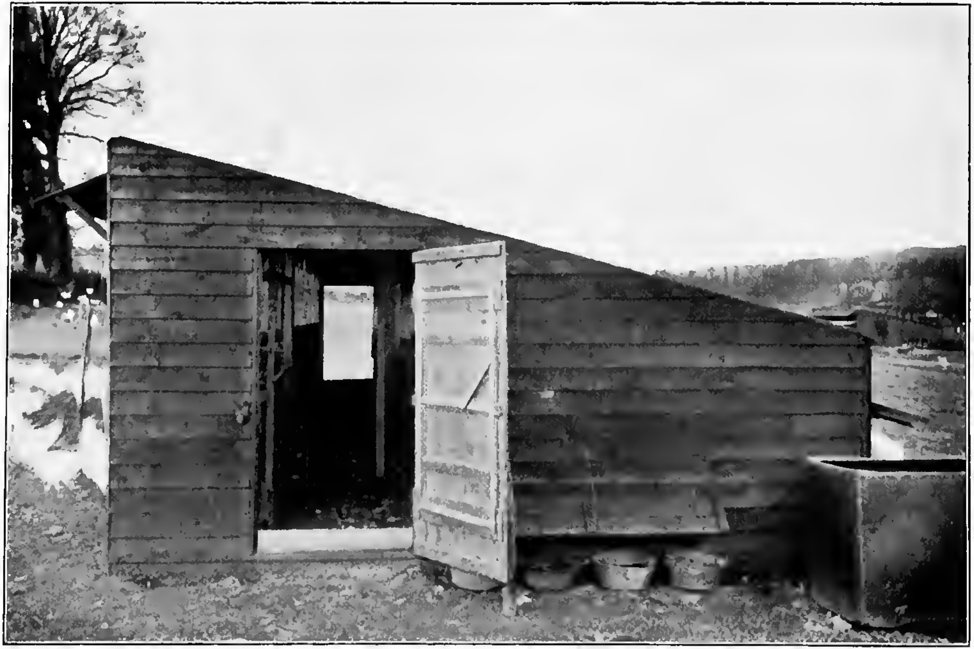
The general habit of the red mite is to feed on the birds at night and secrete themselves in cracks and any refuge they can find in the daytime. They are so minute that they can get into almost invisible openings, and it is very difficult to force the insecticide deeply enough to reach them in all cases. When gorged with blood they are red, when empty, a dirty white. Their presence is generally indicated by a powdery substance being deposited in their environment, generally the perches, to begin with. They are, as I have said, very minute, but they can be seen with the naked eye; under the microscope they bear a very formidable appearance. The only way to deal with them during the season they are active, from May to September, is to keep the spraying machine at work inside the building, but it is more economical, as far as the perches are concerned, to dip the ends in a pail of the solution and paint with a brush.

The rat is the next worse thing. To do him justice, he does not kill chickens very often when there is plenty of food about, but occasionally a doe rat with young will attack the broods. After some years of freedom from losses by rats of this kind, a doe rat killed thirty chickens in one day last spring; about half were destroyed in the morning, half in the evening. I was away all day, or I do not think she would have had the second lot. I told my people that in future, if a loss of the kind occurred again, the first loss should be the last. The best thing to do is to get a gun and set a watch; the field must not be left until the matter has gone further. If the rat does not come on the scene for some time—she generally does; then one bang should settle the matter—the only way is to fetch the terriers, and, guided by them, to try to dig her out; if this is not successful, so break up the surroundings where she lies that she deserts the spot. This is what was done in the case mentioned, and we saw no more of her. If the weather is suitable and the chickens old enough, let a guard of the hens out; they will, when they have chickens, attack a rat with vigour. Something must be done, as a rat will return again and again if they once begin this sort of thing.

I think stoats are worse, but in this district they are scarce. The best prevention is to keep the chicken runs well away from all cover and keep a wide space clear of herbage all round the enclosure. The loss here was my fault, as, having been free of chicken losses by rats for so long, I had the runs pitched too close to a hedge and bank.

Rooks and jackdaws have occasionally taken chickens; if one can be shot and hung up in a prominent position it will generally stop them coming again for a long time. We have also checked them by putting down an egg with traps around it, carefully concealed; this can be done overnight, when the chickens are closed in. If a rook is caught there is a great commotion amongst the others; they will fly round and round the spot, and I have never known them repeat the offence the same season. We are in a fairly frequented neighbourhood, and I have never suffered any loss from hawks. The only prevention, I think, would be patience and the gun. Losses by foxes have now ceased, as with the large house being used for all purposes it is comparatively easy to close down at night; at the same time, doing so involves a good deal of unnecessary work, and it is bad for the laying stock, as they would be much better out in the early spring and summer mornings. At one time foxes threatened the very existence of the farm. There were literally hundreds of small houses, which it was impossible to close down nightly, and foxes often took heavy toll. Eventually we hit on a system of trapping them which was very effectual. We found that they, coming from a direction where they were strictly preserved, ran down one side of the boundary fence of wire-netting. We contrived what appeared to be a casual opening in the wire, and just inside it set three or four fox-traps slightly sunk and carefully concealed. The foxes, coming alongside the opening, would slip through and be in the traps. We caught something like twenty foxes in eighteen months in this way and in the other traps about the farm, for at one time I had about twenty traps set in different places; we covered the traps with boards in the daytime. Our operations caused the Hunt much anxiety and mental trouble. A little experience, the persistent and regular use of fox-traps, will do much to abate the fox nuisance. One man I had became particularly clever at this work. He told me he knew the secret of some preparation that was particularly attractive to foxes; he said he put it on the traps and on his boots and laid a trail to the traps in this way. I do not know what it was, as he claimed he was under some solemn vow never to divulge the secret; anyway, he caught the foxes, and I used to pay 10s. a head for every dead fox. Now rats are our main trouble in animal vermin. Every rat has a price on his tail—twopence a time. Several of the men have terriers, and judging from what I pay they must be profitable investments. We make life as unpleasant as possible for the rats by blocking up their holes with concrete, reinforced by wire-netting, by trapping, by shooting, and by smoking them out with carbide, and by organized hunts at night. One favourite way the poultrymen have is to go round the houses at night. The rats go into the houses to feed through the slots cut in the side of the house over the drinking vessels; the flap over these openings is closed down, and two or three terriers are turned in and by the light of a hurricane lantern catch the rats; the hens, being at roost, are not disturbed. We used poison at one time, but after poisoning a pig, some ducklings, and probably some hens as well, we gave it up as too dangerous. The poison may be put in what apparently seems a safe place, but no doubt is carried about by the rats themselves. Rats certainly are a nuisance here, and a source of heavy loss. I often wonder what we should do if we had the earth floors in the houses that some people recommend.

PLATE XI.



A HOUSE OPENED UP FOR HOT WEATHER.

Both doors are the same size, viz. 6 ft. by 3 ft.

To face p. 95.

CHAPTER XIII

DISEASES AND VICES

One of our best-known consulting specialists on poultry diseases, Miss E. Knight, M.B., of 55 Clarendon Road, Lewisham, S.E. 13, stated publicly that there was no one competent at present to write a book on poultry diseases, as there was too little known about them. I am not going to try to do what I know very well I am not competent for, but I can set down certain simple remedies that we have found effective for dealing with the well-known disease of roup, and I can also describe certain preventive measures adopted for what it is hoped is the prevention of outbreaks of epidemics, for the disinfection of houses, land, water and even the birds themselves. They may be largely theoretical, and may not achieve in practice what we think they do. At any rate, they are comforting, and I may say in their defence we have had no serious epidemic of any kind on the farm since their adoption, the last epidemic—which I will later describe—occurring ten years ago, before I had acquired my present scientific qualifications, or what I flatter myself are such. It is quite possible they may someday let me down; then I shall have to fall back on Miss Knight or some other learned person for guidance and advice.

The question of disease is, however, a very serious one, and it is much to be hoped that the Ministry of Agriculture will inaugurate research on this most vital matter in the near future, and so far it is arranged they will do so. To my mind this seems the one fundamental matter in which the Ministry can do so much for the future of the industry.

On the preventive side, the proper ventilation of the houses is a very important factor indeed. I have attributed outbreaks of roup here both to too little ventilation and also to too much. Poultry are especially subject to disease of the respiratory organs, because they do not perspire, and very probably to kidney disease for the same reason.

Ventilation is one of the most important matters we have to deal with. Bad ventilation will most certainly develop roup, and it is very reasonable to assume that tuberculous disease, to which poultry are so subject, may be accentuated by the same cause.

With the institution of the large house and the large flock, there were on this farm in 1912 and 1913 very severe outbreaks of roup, which were stopped by simply giving a moderate amount of back ventilation to the houses, so that whichever way the wind blows a gentle current of air passes over the birds at roost. No doubt the replacement of long perches with short ones, the stalling off of the houses, the lowering of the perches to within 18 in. of the floor, were all factors in bringing about a change in a condition of things that for a time threatened overwhelming disaster to the whole undertaking, for it was as bad as that. The back ventilating of the houses was, and remains, the dominant factor.

Yet we have now had experiences sufficient to indicate quite clearly that over-ventilation, in other words draught, will bring about the same evil results. The range of houses of which a photograph appears is the case I have in mind. The range of houses is now used for young growing stock. Young birds are more subject to colds of a roupy character than mature stock, as might be expected. Three times has the ventilation of this range of houses been altered. The house being in a very sheltered situation, the front was wire-netting to within 1 ft. of the floor, no back ventilation being given. Then narrow openings were made at the back, fitted with shutters, with the view they should be opened in hot weather; 1-in. holes were also bored close up under the eaves, 1 ft. apart, as well, to be always open. In all three of the conditions described above it was found that the young birds developed colds, and two outbreaks of roup took place. Eventually the larger ventilating openings were permanently closed by nailing down the flaps which used to open or close them, the holes were left always open, but the front was closed up rather more than half-way up, as is the case with all the houses on the farm, and so far the trouble has ceased. It seems altogether proved to me that in this valley back ventilation is essential; but also the birds must be sheltered from draught. Both by the 4 ft. or a little more of the boarded-up front and the stalls with the perches only 18 in. from the floor level, the front gives the required shelter; if the perches were higher it would not do so.

If I were to use the type of house that is generally seen at exhibitions—the one with manure boards, the necessarily high perches above the manure boards, with the corollary of the inmates roosting with their heads within a few inches of the roofs—my farm would furnish an interesting study to the scientists of roup in its various stages for the short period it would continue to exist.

Pursuing this matter further, I freely admit such houses are used apparently with no ill effects—I use the word "apparently" advisedly—on breezy uplands; I have seen them repeatedly; but all the same I am fairly sure that the failure of many of the attempts to run large flocks successfully, and of which many of us have heard, is to be entirely attributed to the failure of those responsible to realize the importance of ventilation.

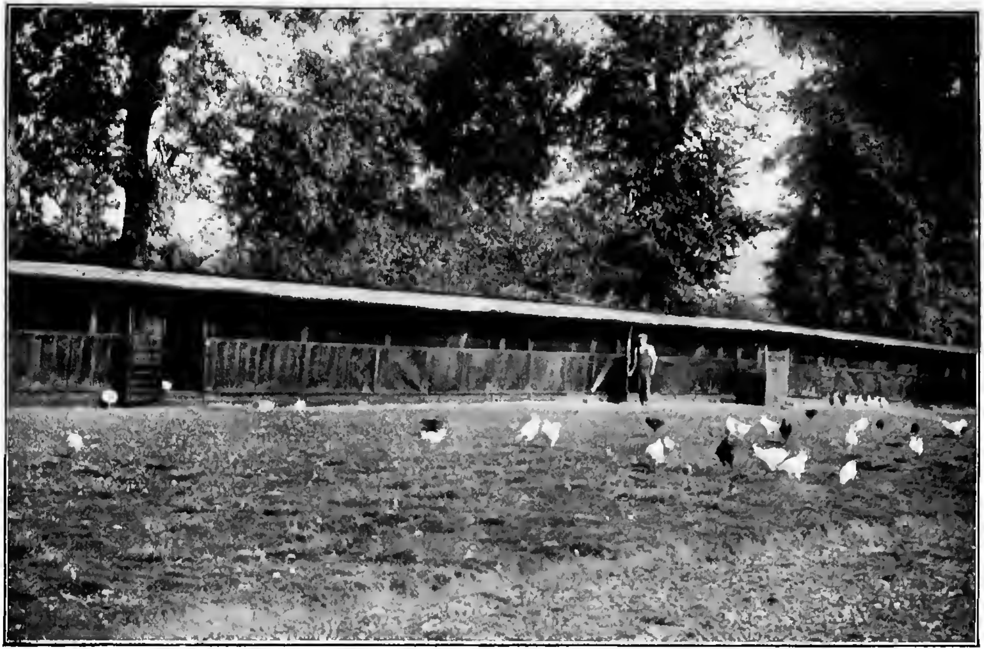
Readers will not forget that I have described this farm as being in a valley, where of course the air is denser, ventilation less free and the atmosphere damper than on high ground. It is therefore reasonably to be concluded that the ventilating of poultry houses should be adjusted to meet the situation. However, in this valley, particularly at certain seasons of the year, we have to accept the fact that roup is endemic to a limited extent. We have had no epidemics of roup for many years, but isolated cases occur frequently; so we think we have become experts in its treatment. If we are not, it is not for want of the opportunity. There is a hospital in the laying field, and another on the young birds' side, to which all cases are sent for treatment as they are detected. The very great majority of cases are cured, and the birds, if females, are returned to the general flocks.

The hospitals are simply a series of pens boarded three sides, with barred fronts and rainproof roofs; they are raised about 2 ft. 6 in. from the ground and have boarded floors. They are an illustration of open-air treatment. The cases we have of roup, compared with the number of birds—up to 10,000 in June and never below 6,500—are very few. The total capacity of the hospitals is about 100 head.

The treatment is as follows for eye roup: Permanganate of potash in a very strong solution composes the lotion with which the eyes, nostrils and mouth are washed.

For diphtheritic roup the same lotion may be used

PLATE XII.



A SECTION OF THE LONG RANGE.

To face p. 98.

for application to the throat after the growths are removed. This is applied with a feather. Iodine may also be used, or a strong solution of white Izal.

The two latter are quite unsuited for eye roup, as they would cause great pain and probably do further harm. Two or three times a week the birds in hospital get a teaspoonful of the medicine, which is given as well to any bird that looks out of sorts. The prescription is castor oil, white Izal and flowers of sulphur. Castor oil is poured into a bottle, enough Izal is added to turn the mixture a light-brown colour; to these is added sufficient sulphur to turn the colour to that of pea-soup. The mixture is warmed by placing the bottle in hot water; it then blends well together. Another very useful remedy in the form of a medicine for roup is a blend of half paraffin and half milk, or glycerine can be substituted for the milk. A good-sized teaspoonful three times a week is the dose we have used.

After the treatment with one of the lotions, the faces are anointed with an ointment made with vaseline and flowers of sulphur.

Fowl cholera is rare in this country, but it is a very deadly complaint. Mr. G. A. Palmer, who has had a very wide experience of poultry diseases, recommends the following treatment: 60 drops (1 dram) to 40 fowls B.P. carbolic acid; this melted or well broken down with water and mixed in the soft food. Glycerine would, I think, form a safer basis with which to mix the carbolic acid. Medicines which are given in soft food should be first mixed in the liquid with which the soft food is made.

Favus, or chicken-pox, is another disastrous disease. It can, I believe, be cured by dressings of iodine and the sulphur ointment. Scabs and eruptions form on the comb or face. I have had no personal experience of this disease. I have been also informed that internal doses of sulphur are beneficial.

"Vet," in *Farmer and Stock Breeder*, mentions the dose of flowers of sulphur for a fowl to be 5 or 6 grains. The dose we give is 1 lb. to 1,000 birds; this amounts to 7 grains per bird.

White-comb is a disease of the comb, which appears to be covered with a fine white powder. A dressing or two of paraffin generally cures. Paraffin may also be a remedy it would be well to try for favus.

"Going light," so-called from the emaciated condition of the sufferers, is probably the result of tubercular disease or kidney disease; there is no cure at present known. Poultrymen often class these as liver disease.

Mr. G. A. Palmer has also recommended in some of his writings sulpho-carbolate of soda for mysterious deaths happening amongst hens and chickens—1 oz. of sulpho-carbolate of soda to each 100 hens for ten days; 1 grain to each chicken per pound or under of live weight.

Cloacitis is a disease of the vent, and appears to be a form of venereal disease. Being contagious, birds suffering from it should be removed at once. It can be identified by its most objectionable smell. I have read that it may be cured by weak solutions of Izal injected into the vent. The rare cases I have had here have been destroyed and the bodies burnt.

At one time, permanganate of potash in weak solution was added to the ordinary drinking water in the pans, but owing to the advice of a clever friend of mine, a Harley Street physician and specialist on human dietary, it was given up. I had observed from time to time in the flocks slight outbreaks of scour, which the men always attributed to the use of fish meal. Personally, I came to the conclusion it was caused by too strong doses of the permanganate of potash; it is very difficult to get the doses given weak enough. My friend told me that permanganate of potash, when it turned brown, was more unwholesome than if taken in the pink stage, also that it left as a residue an irritant salt. We have discontinued its use with apparent benefit, as there are far fewer birds with stained vent fluff than there used to be.

In place of permanganate of potash, my Harley Street friend recommended me to use sulphate of lime as a slow-acting disinfectant and sulphate of magnesia as a quickly acting one. As he rightly said, if the water is pure, nothing is required.

Our water supply is not our strong point. The rain water is collected from the roofs and stored in open tanks, so we put a deposit of sulphate of lime in each tank, which is very slowly dissolved; a small quantity lasts several months. If a piece of the sulphate is taken from the tanks and broken across, the smell of sulphuric acid can be detected. As the water is soft, the slight impregnation by the lime may also be useful. Sulphate of lime is commonly known as gypsum and as plaster of Paris; in the latter form, I think, it is sometimes mixed with something else. Sulphate of magnesia goes under the name of Epsom salts.

All the year round 1 lb. of flowers of sulphur is given in the soft food per 1,000 birds. In the summer, Epsom salts are given in the water two or three times a week at the rate of 1 oz. to each 2 gallons of water. We found great benefit from its use in the hot dry summer of 1921. This was particularly so with the growing chickens, who received it for some time every day. Hot dry summers do not suit chickens so well as temperate, showery seasons, and I must say I was greatly pleased in the way the chickens thrived, notwithstanding the parched condition of the grass. I believe that small doses of powdered sulphur given weekly to all stock, young and old, are beneficial. We give this in the soft food, as stated, at the rate of 1 lb. flowers of sulphur to 1,000 head.

For outbreaks of roupy colds, which are often the premonition of an outbreak of roup proper, sulphate of copper is very valuable indeed. Directly signs appear in any flock of these colds, the sulphate of copper is given every day in small quantities ; if the dose is large, the birds refuse the food, so we find it better to give just such a quantity as will not preclude the ready consumption of the food, and give some every day until the colds cease. Sulphate of iron is given occasionally in the soft food as a tonic. In times past I have used other medicines, more particularly for roup ; but those I have enumerated seem to have settled down as the stock medicines of the farm. It would be difficult to say exactly why they have been adopted—partly from advice I have had from here and there, partly the result of a smattering of scientific knowledge, but mainly owing to what appears to be the result of their use, viz. a lowered death-rate and general freedom from disease. It may be fairly contended these remedies and preventives are empirical. I should be the last to contend that they will always prove successful.

The epidemic previously referred to occurred in 1911. It appeared in a form similar to a very severe influenza epidemic, such as from time to time has afflicted mankind. The attack was eventually cured by white Izal given in glycerine or in water, 1 drop in 60 being about the right proportions. It was given both in the form of a dose and also in the soft food—1 drop per bird per day in the latter case. The drawback of putting it in the soft food is that it renders the food rather unpalatable.

Generally speaking, it is better to give medicines in the soft food by blending them with the liquid used for making the wet mash.

It will be seen that the medicines now used are nearly all sulphates—sulphate of lime, sulphate of copper, sulphate of iron, sulphate of magnesia ; in other words, sulphur in the form of sulphuric acid in combination with some base. They are of the preventive order rather than of the curative, though indirectly they should act equally as well in the latter capacity. After all, a healthy fowl, however good, is only a small unit in value, and so it is far more important to prevent disease—to set up, if we can, an environment unfavourable to the propagation of disease germs rather than to cure isolated instances of disease. Generally speaking, a sick fowl is best disposed of as soon as possible ; she may still serve a useful purpose in the furnace by helping to cook the food for her more fortunate companions. The methods are described in previous chapters which are practised with the belief they keep the land in a healthy condition. The regular disinfection of the houses has also been referred to.

These two, in combination with the use of antiseptic medicines or internal disinfectants, are the calculated plan for maintaining a healthy environment for the poultry, with the reverse for their enemies, the organisms of disease, and their allies, insect vermin.

It may also be as well if in this chapter reference is again made to the large part vegetables play in the menu of the poultry, for it is believed that this system of feeding is a means of promoting health and thereby increasing the powers of resistance to disease inherent in the birds themselves. I have made no reference to the mysterious vitamines some people are so eloquent about, because, although we all now know, or think we do, that these accessory food factors are an essential necessity, while scientists differ so widely as to what they really are it is as well for a mere layman to leave the subject alone. It is enough for us to know that they exist, and as far as poultry are concerned they get sufficient in the foods supplied, more especially in fresh green stuff. Also, perhaps, I may go so far as to say that the discovery of vitamines partly explains the great value that fresh vegetables possess as food-stuffs, much greater, in fact, than their chemical analysis may indicate.

Before leaving the subject of poultry diseases, I may be allowed to remind my readers that as poultry are birds, their physiology is different to that of mammals. We have proof of this in the fact that what will be a poison in any quantities to birds—for instance, salt—is harmless to animals. There are also substances which, while practically harmless to birds, are poisonous to animals. This being so, it is obvious that until long research takes place on this question of poultry disease, we are very much in the dark, and our treatment of disease and our preventive measures must be of the empirical order.

Poultry are subject to a number of diseases. Fortunately, their vices are few. Two only are worth referring to: egg eating and feather plucking. The former, of course, is much the worse. The best preventive is to keep an abundant supply of shell before them at all times, with a few china eggs lying about the floor.

There are two remedies: (1) the cutting of the point of the upper mandible until you see red: if this fails, (2) breaking the neck. As a rule, the very complete remedy is not often necessary, as with a tender beak the hen cannot break the shell of an egg. Still, there are cases when they remain obdurate; there is then no alternative but to use the second. Poultrymen should always be on the look out for this vice. If there are grounds for suspicion that egg eating is taking place in any flock—the egg records should be some guide—then by putting an egg on the floor the culprit can usually be detected, as she goes for the egg, to use a homely expression, "bald-headed," in a very different way to the half-hearted way most hens will turn over an egg they find outside the nests on the floor.

Number one treatment must be given at once. On the next day it will be advisable to repeat the test, for sometimes the cut beak will not prevent a successful attempt at breaking another egg. Then number two must be used. It is always a suspicious circumstance if no eggs are ever found on the floor or in the corners of a particular house. Hardened criminals may even visit the nests to eat eggs, and it is a habit for which a sharp look out must be kept, or very serious losses may be incurred.

I don't remember ever possessing a feather eater: it is a vice that is peculiar to poultry kept in very close quarters, without exercise or proper occupation. I believe that the beak can be pared so that the bird cannot grip a feather, but can still feed properly.

The following three ailments are either not serious or are preventable:

Scaly Leg.—This is caused by a parasite which penetrates under the scales of the leg and causes unsightly excrescences. It is rare on this farm. This I attribute to the free use of disinfectants, such as Izal and the spraying and painting of the perches as before described. The disease can be easily cured by dipping the legs in paraffin up to the hocks, or by painting them with the mixture of paraffin and water-gas oil. These dressings can be followed with a mixture of vaseline and flowers of sulphur with advantage; one or two dressings should be sufficient.

Layer's Cramp.—Pullets often lose the use of their legs after a heavy bout of laying and appear helpless. They should be placed in a hospital pen, the floor of which is covered with ashes. Feed lightly on grain, and so induce the bird to take a rest. A full recovery is generally made.

Chicken Cramp.—This is not true cramp, but is more of the nature of rheumatic gout; the congested blue veins can be seen in the victims. It is the result of artificial conditions, represented by attempting to rear chickens under cover in the early part of the year, either by natural or artificial methods. Chickens reared by hens in coops which are out in the open rarely if ever suffer from this deadly complaint.

The only real preventive is to get the chickens out in the open on the open ground. Brooder houses are so attractive in the cold months that chickens reared in these will not remain outside.

A friend who rears artificially early in the year with success uses for his chickens the well-known 6 ft. by 4 ft. barganette type of house, with an oil-lamp-heated hover. After the first week, during which they are in the ordinary small heated brooders, the chickens are placed in lots of 100 in these cabins. Here the conditions are similar to the hen and coop, in that the small area of the house induces the chickens to pass freely in and out, thereby spending a good part of their time in the open.

A new disease has lately been diagnosed called the air-sac disease. This is the result of the air-sac walls and air passages being invaded by a very minute mite. As these increase and multiply in great numbers, wasting takes place, and the bird eventually dies.

Such a complaint as this, together with kidney disease and tuberculosis of various forms, are probably often all classed together under one heading as liver disease. It may, I hope, be assumed that the inhaling of disinfectants, such as I have notified as being in constant use on this farm, is a preventive of the air-sac mite.

The system of disinfection of all kinds advocated—of the birds, the houses and the land—is expensive, my bill for disinfectants of all kinds running up to about £180 a year, equalling a charge of sixpence a head on the laying stock. If, however, these precautions achieve the object it is hoped they do, it is money well spent. However careful we are, it cannot be denied poultry live in insanitary conditions. The fact they are fed in litter that must be contaminated with excreta, the large numbers on the ground, the confinement, all go to establish conditions which are so opposite to those which are natural to birds especially. Birds, of all living creatures, live in the most healthy surroundings when in a state of nature. It is said partridges never sleep twice in the same spot. Poultry no doubt have become immune through thousands of generations to conditions which would have killed off their wild progenitors. The turkey, the last of poultry stock to be domesticated, is more sensitive a good deal to disease than the hen.

Possibly all these precautions of mine may be considered too meticulous ; possibly they may not even be responsible for the immunity from serious disease which the farm has experienced for so long. I shall, however, continue to persevere with them until the scientists can give the poultry world more definite information in the way of the prevention of disease. It is prevention we are out for, as being far more important than curing disease when it occurs. A hen suffering from some obscure disease is rarely worth treatment.

One of the most important factors for the prevention of disease probably is the alternate use and disuse of the land. One of the medical staff of the Ministry of Agriculture informed me that research had proved that the bacillus of swine fever could not live more than fourteen days outside the body of the pig. This discovery has saved many thousands of pounds a year previously spent on disinfectants. All that is now necessary is to close down the premises and prevent any pigs being kept on them for twenty-one days.

The bacilli of other diseases are probably not all so accommodating, but the principle is the same ; with the absence of the host the germs die.

CHAPTER XIV

THE VEGETABLES AND THEIR CULTIVATION

THE results of using a large proportion of both cooked and raw vegetables proving so satisfactory led to the cultivation of part of the holding for their production; previously they were purchased as potatoes, swedes and mangolds. All three of the latter can be bought cheaply in many districts, and it may, in many cases, be cheaper to buy than to grow; the potatoes can especially be bought cheaply in potato-growing districts as what are known as "cattle potatoes." Unfortunately, it would not be very easy to buy fresh vegetables of the cabbage tribe, and these are an important factor, as they balance the roots so well. The land on this farm under cultivation is a strip of alluvial land of the kind usually bordering on a river—a low meadow, which probably before had never known the plough. The work of reclaiming it to arable was very heavy for men and horses, but after being under the plough for three seasons it is now extraordinarily fertile and produces large crops of vegetables in the driest of seasons. The crops that suit it best are kolhrabi, mangolds and artichokes in the way of roots, and rape and cabbages of all kinds. On the drier portions swedes can be grown with onions and lettuce. Potatoes are not grown, as they involve much labour; the land is not suitable for them except in a very dry season, and compared to the other crops the yield is small. Still, potatoes boiled in their skins, notwithstanding what has been said against their value as a poultry food, are, I am persuaded, an excellent article of diet, providing they are balanced with nitrogenous foods such as fish meal, maize gluten meal and dried yeast; with these and middlings an excellent mixture can be made, which may include a large proportion of potatoes. During the war I had one year grown a good crop of potatoes on my upland farm; these were carted to the poultry farm, and for several months the soft food fed to the poultry contained about one-third of its weight as boiled potatoes. The poultry did well and laid well.

There are four acres under cultivation, and I estimate the weight of vegetables raised of all sorts to be in the neighbourhood of 120 tons per annum. I am surprised that more of this rich, lowlying ground is not put under the plough, it produces such enormous crops and is impervious to droughts. We grow a series of crops that provide throughout the year sufficient for both the poultry, pigs and horses at very little extra expense. Pigs are a doubtful proposition for profit when all food and labour is paid for. When grazed and partly fed on roots, they pay very well indeed. Mangolds, kohlrabi and artichokes are the principal roots grown; they are all heavy croppers. Rape and white turnips are sown in March. The artichokes are also planted in March; the cultivation is on the flat, but in other respects similar to that for potatoes, which they resemble in feeding value. In harvesting it is important to clear the ground as well as possible, as otherwise the succeeding crop may be too thick, with a smaller yield in tubers; when once established, they are difficult to get rid of. They should be set in rows 2 ft. apart and about 2 ft. between each plant. April is the principal month for cultivation.

Then kohlrabi is drilled on bouts, the cabbage beds prepared and sown with savoys, Brussels sprouts, cottager's kale and sprouting broccoli, the young plants from which are set out in June. In May the mangolds must be got in; rape will be sown again. This is an extremely valuable plant; a crop can be grown in six weeks, and it gives two cuttings. Poultry old and young like it, either raw or cooked, and it is a great stand-by with us for the growing stock, to which a great deal is fed raw. In the early stages of chickenhood they have lettuce and onions.

In June or late May a few swedes will be drilled, and we commence to set out the cabbages. In July the thinning or setting out of the mangolds and kohlrabi is done; the thinnings of the latter are used. These roots are also left close together, so that every other one can be pulled later in September for the coppers. In July or early August the winter onions are sown for the chickens of the next season. The spring cabbage beds are sown, these being set out in September and October to provide cabbages to follow the winter greens. Sowing and planting goes on from March to October, in fact. The work is mainly done by one man, who has charge of this department and directs the poultrymen in gathering the crops. He is helped by the poultrymen in any spare time they may have—the rearing staff have a good deal from July onwards, until it is time to get ready for the next rearing season.

The thinning of the mangolds and kohlrabi is done in the long summer evenings; for this work overtime is paid, and there are plenty of volunteers. Overtime is not paid for work directly concerning the poultry, but for land-work and haytime it is. To sum up, in July, when the mangolds and spring cabbage with the early rape are finished, there are the early sown turnips and the thinnings of the kohlrabi to take their place. In September the kohlrabi second thinning comes with swedes; these, reinforced with artichokes in November, carry us on to February, when that very useful root the mangold supplies the root ration through the spring and early summer. Throughout the year every effort is made to supply some members of the cabbage tribe as well.

With the exception of the mangolds and artichokes and the finer vegetables grown for the chickens, the rape, cabbage, turnips and kohlrabi are all members of one tribe; they are all therefore subject to the disease known as "finger-and-toe," "club-root," etc. In this new soil no sign has been at present seen of this disease, as might be expected; but whether we can continue to grow crops of this kind indefinitely with little change in the rotation remains to be seen. I hope to do so, by giving regular dressings of burnt lime, which is the best preventive, fairly frequently, say once in three years, at the rate of 2 tons to the acre, or a little more.

The pigs and poultry, of course, supply far more manure than can be used on this small area of cultivated land, but the crops mentioned, with the exception of the turnips and artichokes, require plenty of manure if the large yields are to be maintained. The mangolds must be harvested at the end of October, as they are susceptible to frost. They are built up in a long clamp, covered with a thick coating of straw, and earthed up; the clamp should be ventilated; the whole operation is very familiar to country dwellers. The leaves, when the root is pulled, should be twisted off, not cut. Kohlrabi are not hurt by frost; when growth is completed, they lie on the surface of the field and can be gathered as required by severing the tap-root. Artichokes resist frost, but as they cannot be dug in hard frost and are difficult to separate from the dead plant's fibrous roots when it is frosty, a stock should be kept available and pitted, as potatoes are; but the same care to protect from frost need not be observed as is most necessary for potatoes. During the winter, at favourable opportunities, the whole crop of artichokes should be dug and pitted for future use, but they are not of much value after April, as they shoot fresh growths so freely. The harvesting of the artichokes must be completed if possible by the end of February, leaving the bed free to be replanted in March.

CHAPTER XV

THE ECONOMICS AND BUSINESS SIDE OF THE UNDERTAKING

THE subjects of this chapter are not the easiest part of the whole to deal fairly with. I am anxious not to discourage enterprise, but I am aware that very wrong impressions exist among many, to whom it seems simply an alluring business, as to its profitability and the ease with which sufficient knowledge of its technique can be acquired.

How often have I received letters commencing; "I am contemplating poultry farming. So-and-so has advised me to see you. Will you let me look over your farm, and spare me a little time to give me some information on the subject?" The only information I can give the aspirant to poultry farming is the same as I could give about flour milling, provender milling, or general farming, all businesses of which I have had experience and possess a little knowledge about. These businesses all pay more or less, according to the capacity of the management—less than is expected, perhaps, oftener than more; but they all, in common with poultry farming, will dissipate the owner's capital with equal readiness if the management is inefficient and if the control is in the hands of those who have not been long and carefully trained to be equal to this responsibility. They, in common with poultry farming, are very unlikely to succeed if the capital in hand is inadequate, and neither can success attend those who are naturally incompetent, even with the requisite training and capital, to control any business. The conclusion to be arrived at is that if people will light-heartedly enter this highly technical industry without the necessary training and capital, they will end by contemplating the loss of their money, unless they are blest with enough to enable them to buy their experience in the most expensive way of all.

After this encouraging beginning, I will try to get a little closer to the subject. The pioneers of commercial poultry farming had by no means a rosy path to tread. There were, up to about 1911–12, no precedents to guide us—we had slowly and expensively to grope our way.

About the time mentioned Mr. S. G. Hanson, now of Basingstoke, came to this country, bringing new ideas with him : and further information, in the form of books and papers, as to the work done in America, began to circulate amongst us. Commercial poultry up to about 1912 were kept in an interminably large number of small flocks in small roosting houses. It was the condensing of these small flocks in large houses, in large units, which was the basis upon which commercial poultry farming as a successful industry was built up. The advent of the large laying house, and the institution of the Semi-intensive System, by no means, however, settled the question; we had a lot to learn besides. In fact, under the old extensive system I had generally made a profit—quite a small one, it is true, and probably derived mainly from the setting-egg trade; whereas with the large house I had at first a very rough time indeed. It is hardly possible, and not worth while, to try to explain all the causes for this, except to say in a general way we had to adapt the large house and flock to the English climate, to learn how to manage it, and even by experimental work to decide upon the type and the fitting up of the houses best suited to our class of work and climate and situation.

The climax came one year, in which my loss ran into four figures, partly caused by the economic situation, dear food and relatively cheap eggs. My friend and partner with me in the flour mills begged me to give it up. I fell, I know, in the estimation of our accountants because I refused. Then the turn came, and three or four years afterwards, after the balancing of the accounts had taken place, I said to my friend, "Well, what about the poultry farm now?" "Well," he said, "it is wonderful, most extraordinary! Do you know what has been done? You have paid all the losses, you have paid for the whole thing, plant, houses, birds, lock stock and barrel—and you have drawn ——, besides receiving all your capital back." I had just got the farm round in time to be ready for the last excellent four years, such years as we are never likely to see again.

The compensation I have received, as of course is to be expected, seems to me only a fair recompense for both the moral and financial trials of the past, and, when spread over the long term of years in which they occurred, seems to me quite moderate. I am quite aware such years are not likely to occur again, and God forbid they should, through a similar cause. They will not occur, because, like everything else, eggs are getting cheaper, and cheaper eggs must mean lower profits.

If we divest our minds of the idea of money, and think in terms of eggs instead, we shall see this must be so. Broadly speaking, it takes just as many eggs to keep a hen when corn is cheap as when it is dear; the price of eggs will follow that of corn. Wheat is the important index of food values. If wheat goes up, feeding corn follows; if feeding stuffs advance, meat and dairy produce of all kinds, including eggs, follow. There may be delay, there may be times when the relative values of the different articles may be cheap or dear, but the economic law is inexorable in the end. When wheat falls, the reverse happens. Wheat has fallen, eggs will fall. If it takes 50 eggs to feed a hen for a year—it should not cost more—and if it takes about 36 eggs more to pay other expenses, and I think this is a fair computation, there will be no profit until the average yield rises over 86 eggs per hen per year. In the light of the florid advertisements we are so familiar with, it would seem a matter of course that the yield will soar far above this.

Keeping large numbers of birds on a commercial basis is very different to poultry keeping in a small way, when undoubtedly large yields are often obtained. It will be safer, and probably nearer the facts, if we compute our egg yield from 110 to 120 per hen per year of her three years' average life ; and if attained, by no means disappointing. I would commend my readers to follow the laying competitions if they desire corroboration of this statement ; they will find the average yields, for the whole flocks of tested birds, are generally in the neighbourhood of 150—rather more, and also rather less. The great scores of the winning birds leave me cold; they are the exceptions, not the rule. Perhaps for the sake of the continuity of the race it is as well it is so. We have also to remember that these birds are all pullets in their first year, the most productive year ; they are selected birds, the best selected from many flocks ; they are in small flocks, carefully housed, and in the hands of the most expert poultrymen of the day. My estimate seems rather optimistic in the face of all this. The point I am coming to is, that it makes all the difference in the world to the net profit per hen as to what price the 20 to 30 surplus eggs which accrue after her upkeep is paid for realize. In the past years they have been sold as high as 4½d. for the average for the year. If they fall to 2d., as seems probable, the net profit falls accordingly. This is why I have emphasized the importance of breeding, for it is by breeding we must look to increase the average output, and by breeding also improve winter production and the table value of the by-products in the shape of the cockerels. It makes a good deal of difference if you make a shilling profit on the cockerels, rather than a loss of sixpence or a shilling.

It appears very much as if the profit per hen will fall to 4s., possibly 5s., per head; even so, it is the most promising branch of agriculture of the time.

In the first chapter I have stated that this farm will in future be entirely devoted to commercial production, and will stand or fall on this basis. It may be as well if I stated more fully the reasons that brought about this decision. Looking back on the past, it would seem to be that it is a form of evolution that has brought this about, almost unconsciously on my part.

To attempt to have established the undertaking as a pedigree poultry farm did not appeal to me. I am not fitted for the work temperamentally, and neither had I the time, with my other occupations and the public work in which I had become involved. So I kept on developing on commercial lines, and as the farm increased it became necessary to shed first one and then another of the specialities of the breeder. I gave up selling pullets first, because I had none to spare, owing to the increase that was taking place in my own stock year by year. The same cause led to the relinquishing of the day-old chicken trade. The trade for setting eggs was still, however, looked upon as an important stand-by, and it is only recently that I have realized, or think I do, that it would be good policy to even relinquish that too, save in a very small local way. It will be better if I just tabulate the reasons ; they will explain themselves.

(1) In the great boom year of 1920 I sold 116,000 setting eggs. This paid very well. In 1921 the sale dropped to 70,000. If another serious drop occurred, which I thought very likely, the extra profits on the sale of setting eggs might not cover the cost of the incidental expenses, such as the provision of a large number of cockerels, advertisements and printing.

(2) The analysis of the accounts indicated that the sale of setting eggs at moderate prices did not pay as good a profit as might be expected. Not having pedigreed stock, I could only expect moderate prices; neither could I sell a large number, except at relatively low prices.

(3) The sale of eggs for setting seriously militated against establishing the selling of commercial eggs on the most profitable basis. The demand for setting eggs being most acute in the last month and the two first months of the year, just when the buyers of table eggs were most anxious for supplies, they naturally resented having their trade turned down. This state of things did not exactly facilitate matters when table eggs became plentiful and the demand for setting eggs declined, later to cease altogether.

(4) Instead of breeding a considerable number of cockerels annually, from which to select the 350 required for the breeding pens, I now only want about 50. Houses and land are released for the growing pullets,

which I badly wanted. The early cockerels are sold on the best markets for spring chickens, and the room occupied by the cockerels in the laying houses is now filled with layers, who last from two to three years or even more, against one year for the cockerel.

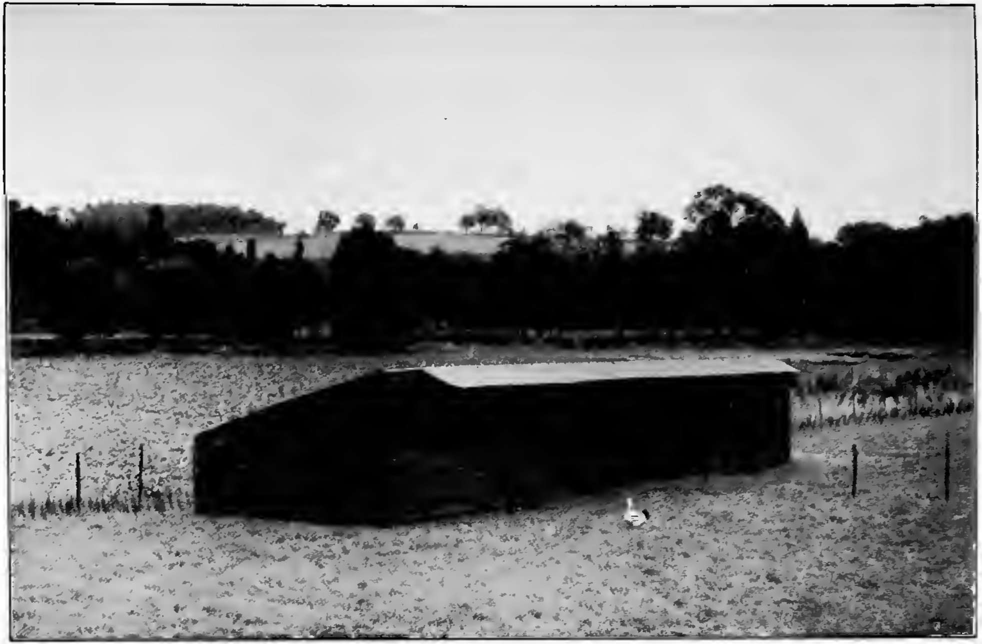
(5) To fill the requirements of the buyers of setting eggs, a good many varieties should be kept. To maintain a number of varieties in a high-class condition, both as to vigour and production, is not the job of the commercial poultry farmer. I can maintain a few breeds in high condition. With a very limited number of breeding pens, I can select the very best birds for breeding: with many pens it means the breeders are merely average birds.

(6) I found, in fact, it was becoming more and more difficult to ride two horses at once, that I could ride neither well, and that eventually I should come a cropper between them.

The capital required is always naturally the first consideration. It is a very difficult point to deal with. The amount required depends upon so many things. If the novice has to keep himself during his training, if he has also to provide his maintenance until the new undertaking becomes remunerative, it means, of course, that a great deal more is required than if the first two essentials are provided for from outside sources.

The time necessary for training, and for setting up and getting underway, cannot very well be much less than three years. Again, it depends very much whether the whole plant is to be home-made and built on the simple lines previously explained. Although in the first edition I endeavoured to give an estimate of the expenditure for a small plant, I confess it is a matter I am inclined to shy at.

PLATE XIII.



THE EXTERIOR OF ONE OF THE NEWEST LAYING HOUSES.

The second door was fixed later.

To face p. 120.

A young friend of mine has just commenced erecting a plant in this district, modelled on the plant described in this book. He has spent rather more than a year in training with me; he has been through all the departments, hatching, rearing, laying hens, land-work, pigs, and carpenter's shop; he has helped the carpenter to erect the last house I expect will be built on this farm. His father intended to settle him in Hampshire, but by my advice has bought some land here. I have undertaken to help him lay out his farm, to advise him about material, and have also found him a very good local plain carpenter who at one time or another has done a lot of work for me. I pointed out to his father that, though the boy was very good, and observant above the average, he had only been through everything for one season, and it was not giving him a fair chance to put him on his own yet. Here we can look after him, and if in any difficulty he can apply to me, or one of my experienced men. As the farm is only a mile away, I can go up and watch the proceedings.

My advice to him is not to buy a single bird now, but to spend this winter preparing plant for next year, and then next spring to make every effort to hatch, both with an incubator or two and hens, enough chickens to rear 1,000 pullets; all the chickens to be reared by hens. I told his father with reasonable luck he should be self-supporting by January 1923, commencing as he has in October 1921. Having once become self-supporting, then the developing of the farm should proceed slowly, during two or three years, until it reaches the maximum of 3,000 layers, the capacity of the land, viz. 22 acres.

I have gone into the figures a little, and for 5 laying houses, each 60 ft. long, 100 coops, 30 brooders, a house and nesting appliances for 50 sitting hens, a bungalow made out of an old Army hut, with the necessary utensils, food and feeding arrangements, he will probably get his 1,000 pullets in laying form for £1,200 outlay, his father providing for his maintenance up to January 1923. It will only be done by great care and industry on his part. He was one of the very best workers it has been my pleasure to train, and I have had a good many trainees through my hands the last three years. The sitting hens I expect will largely have to come from this farm on hire. I shall supply him cheaply with eggs, too, in return for his good services while with me.

Instead of drawing up a formal estimate of costs, I have related the above. I think it may be fairly estimated that at present prices it will take 30s. a hen to set a farm going, if the prospective poultry farmer has his training and maintenance paid for from other sources up to the time his farm becomes self-supporting. If he has to provide these himself, £2 a hen. I should emphasize that the capital of £1,000 for my friend is quite exclusive of any capital outlay on land, and this statement also applies to the other estimates of 30s. and £2 per hen.

It is quite obvious that as the fixed plant is generally worth more than the land, it would be very unwise to establish a poultry farm on hired land, unless there was a distinct option of purchase. The case might be different on County Council land, which is not likely to be required for the purpose of building, or on Government land. Five hundred head of layers seems to me to be the smallest unit by which a decent working-class living could be gained.

The technical side of the industry is very important, and in this department the art of breeding stands very prominent. It is probable that some of us, deeply engaged as we have been in the work of development and organization, have not sufficiently realized the importance of research work in breeding. Besides this side of the work, there is the business side; I mean by this buying and selling, the accounts, and the daily, monthly and yearly records. The commercial poultry farmer must acquire a knowledge both of the commercial value and the feeding value of feeding stuffs. He can partly do this by studying the corn trade papers and by obtaining books on the subject; these should give him some guide as to the value of the chemical analysis and the digestibility of various foods. Chemical analysis alone will not do; the digestibility of foods is of really more importance.

The commercial poultry farmer should do his own mixing, buying the various meals separately and blending them himself.

Valuable information on feeding is often given in the Poultry Press; very contradictory statements also unfortunately appear. In one week I observed a note in one paper emphasizing the value of cracked maize as a food for laying hens; in another paper I observed that a writer stated boiled potatoes were the worst of all foods for poultry, and maize came next. I need hardly say, after what I have written, that I agreed with the first, but I felt sorry for the novice who might happen to read both paragraphs.

It is one of the advantages of the business that, having produced the finished article, it is easily sold; still, care is required to see that the best prices in the market are obtained, and it is well to have two or three strings to one's bow. The large producer is in a much better position to sell, as a rule, than the small one, if the latter is not in a position to retail his eggs. There are plenty of buyers who are glad to get large and regular supplies of reliable eggs.

I always think that the preservation of eggs in water-glass comes under the business side of egg farming, because in the time of heavy supplies it helps to reduce the glut, but more especially because of the moral effect a line of preserving tanks has upon both seller and buyer. Many a time, when business has been a little difficult and my views on value did not accord with those of my prospective buyer, has a reference to preserving helped me to get, if not all my aspirations, the greater part of them. Really, egg preserving is an integral part of the business, and should be practised more than it is, partly for the reason stated above, but also because it pays well in itself. My tanks hold 20,000. I have, however, never filled them all yet, but every winter I wished I had. With the passing of the setting-egg trade, I shall be able to do so now, and with infertile eggs, which are much the best for the purpose. There are four tanks here, placed in a small brick building with an equable temperature. Each tank is 3 ft. 6 in. long, 2 ft. 3 in. deep, and 2 ft. 8 in. wide, inside measurements. They are built of brick and cement, and are coated inside with a cement and sand lining. They have wooden lids. The solution of water-glass is prepared as follows: The water is boiled, and when still hot is placed in the tanks. The water is weighed, and to each 10 lb. of water is added 1 lb. of water-glass. The water-glass is put in the hot water and well stirred at intervals. The mixture will have a greasy or slimy feeling.

As soon as the mixture is cold, the eggs are put in the tank. The tanks are about half filled with the solution to begin with, and as the eggs are put in they of course displace the solution. As the tank becomes nearly full, any further quantity of the solution required is added from a fresh supply which has become cold. The solution should not come in contact with any eggs before it is placed in the tank in which it is to remain.

A scoop made of perforated metal is used for lifting the eggs out of the tanks.

A complete system of bookkeeping is to the business man as the compass is to the sailor; without good accounts, which include full statistical records, the management cannot guide the destinies of the undertaking with any degree of confidence. The general accounts, by which the profit or loss account is prepared at the yearly balancing period, should be kept on double entry, so that if any error creeps in during the year, the balancing will show that the said error has been made. The very fact of knowing this is a great inducement towards accuracy on the part of those who keep the books, as if the error postulates, it will be their job to trace its origin. The accounts and records should be of such a character that, if from any cause the manager is unable to supervise in person on the spot, he should be able to follow in detail the results of the daily work, not quite so efficiently, of course, but almost as clearly.

The general accounts of this farm are kept by a trained lady clerk and storekeeper.

They have been elaborated by degrees, and a system of checks and counter-checks proves the accuracy with which they are kept.

Beginning with laying houses: in each of these there is a card ruled and prepared to carry on the history of the particular house in which it is. On one side it shows the daily collection of eggs, and on the other it is ruled to keep stock of the number of birds in the house. These can be seen at a glance. Three columns are required.

The first is headed "Birds In," the second "Birds Out," the third "Total." The actual number of the birds is ascertained by taking stock on January 1st and July 1st, the dates on which fresh cards are required. The correct number is entered at the head of the "Birds In" column; then any bird that for any cause is removed is entered in the "Birds Out" column, and the figure in the "Total" column corrected accordingly. Any fresh birds put into the house are entered in the "Birds In" column, and the total number corrected accordingly.

It is very simple, and one of the standing rules is that everyone in charge of the birds must carry a pencil.

A card for recording deaths is hung up in the copper sheds, as all dead birds go there to be burnt in the furnaces. Each death, with the number of the house in which it occurred, is entered on this card. Every day the storekeeper hands out three slips with the names of the three leading men on them. These slips have printed on them the numbers of the houses in each particular man's charge. It is the special duty of each of these men to see that the eggs collected each day are booked up against the number of the house in which they are collected, also any death that may occur in each house against the particular house. There are two columns on the slips, one for eggs and one for deaths.

These slips are handed in to the storekeeper with the day's collection of eggs. She summarizes all these, and enters them up on a card in her room. This card is designed to give full particulars of all that takes place in the way of eggs collected, chickens hatched, deaths of old birds and chickens, eggs set under hens, and breakages of eggs, both as a daily and monthly record. I give a facsimile of this chart at the conclusion of the chapter. At the end of the month I take this card and enter up all the records in a private book of my own. I can then compare results, month by month, year by year. At the end of every month a balance sheet is handed me, which shows the number of eggs collected and accounts for their destination, also showing discrepancies one way or the other. Every time a draft of pullets is taken for the laying houses, a return in writing is given me. I thus know accurately the number of pullets reared and the proportion of pullets to cockerels. I keep this record in my private book.

All the above is now part of the daily routine of the farm. It works very smoothly, but it took some time to get it all worked out. The checks and counter-checks quickly show if anyone is careless in making his returns. If for any cause I was unable to visit the farm myself for a time, these returns given me daily would clearly indicate the course of events. Nevertheless, I do not wish to infer that statistical records can take the place of that personal supervision which is so necessary, or the careful keeping in touch with the work day by day which is not only expected, but appreciated and looked for by the best operatives. The best of men will get slack without the supervision of the management, and they are also quick to notice derelictions on the part of the management in their particular work.

Poultry farming is a branch of agriculture, and therefore asks for more initiative and versatility of action on the part of the workers than is perhaps the case in what are called industrial concerns. And although the spirit of co-operation is most desirable in all industry between employers and employed, it is particularly necessary in all matters pertaining to agriculture. Fortunately, agriculture particularly well adapts itself to some form of co-partnership. As an old employer, both of agricultural and industrial labour, although I recognize the great difficulties that confront profit-sharing schemes in industry, I would not attempt to carry on any agricultural branch unless I could ensure obtaining the willing co-operation of the workers by some form of co-partnership over and above the mere payment of weekly wages. After trying both direct profit-sharing and paying a bonus on output, I unhesitatingly plump for the latter.

Profits may be made or marred by the acts of management, with which the workers have nothing whatever to do. Again, to a working man who, perhaps, after giving of his best, has counted upon receiving the accustomed recompense, the disappointment of finding that there are no profits is of a very depressing character. Such an event is not calculated to encourage him to further effort. After all, in agriculture, what we are out for is output, providing it is obtained with due regard to economy; the latter condition comes within the province of the management. On this farm a bonus is paid on all the output that is sold—eggs, poultry and pigs; the stipulation is that it is calculated on sales.

Up to the present a fixed amount has been paid on every 20 eggs sold, on every head of poultry, and on every pig sold. The fluctuations of the last few years resulted, of course, in the raising of the bonus from time to time, and it looks now as if the lower prices of the future will necessitate reductions. So to avoid the sharp variations caused by the alteration of the amount paid on so small a unit as 20 eggs or a chicken, I propose after this year to pay a dividend in the pound on sales of every kind. The graduations will not then be so steep, and the bonus will automatically adjust itself to every level of prices. To assist me in the management a small committee is formed, one man from each of the three departments—the rearing side, the laying side and the land. This committee meets me formally every quarter, or oftener if necessary, when any questions that arise respecting management are discussed, and the allocation of the bonus, which is paid quarterly, is settled. The bonus accounts are submitted to this committee; these show how it is arrived at. The amount is distributed in accordance with the measure of responsibility resting upon each worker on the farm; all are included. Efficiency is also taken into consideration.

It is my office to make the proposed allocations to each individual, and the committee are invited to criticize if they think the allocation is not fairly done. The standard wages paid to each adult worker are the same, and the differences in responsibility and efficiency are accounted for in the amounts paid in the bonus. The scheme works very well indeed, and establishes a co-operation between us all of a very pleasant character. Everyone gets in the habit of talking in the plural: it is "we" and "our"—expressions that have been used continually, I think, by myself throughout this account.

The effects of these arrangements were felt when the Government in their wisdom established the Agricultural Wages Board. As soon as I realized what their regulations meant, I called my farmworkers together and explained them. I then asked them what they were going to do about it, and said that I knew what I was going to do, and that was, that if I had got to run the farms on these terms I was going to get out of them at the earliest possible date.

The answer came quickly, "Don't do that; we are quite satisfied. You have given us in the past concessions such as half-holidays and Bank Holidays, and other things, of your own free will, and we will carry on now as usual." We did. I employed on both farms nearly 20 workers all through the life of the Agricultural Wages Board, and never heard another word about it; in fact, I don't think any of us really knew, or troubled to follow, what the Board's decisions were. The cast-iron formulæ of Trade Unionism have done a good deal of harm in industrial concerns; they are altogether impracticable in agriculture. The seasons vary greatly in the call they make upon us who are engaged in this, the first of all industries; to attempt to impose a rigid eight-hours day, and other concordances of industrial life, will only result in the failure which has been the result of the Wages Board's efforts to socialize an industry which is, of all others, the most unsuited for interference of a socialistic character.

Ill-advised Government interference, coupled with the operations of the Agricultural Wages Board, has resulted in an amount of unemployment among agricultural workers that has probably never before been equalled.

T. W. TOOVEY.................... POULTRY FARM ACCOUNT FOR..............

DATE	POULTRYMAN					POULTRYMAN		POULTRYMAN		....	
	Deaths.		Eggs.		Chickens Hatched.	Deaths.	Eggs Collected.	Deaths.	Eggs Collected.	Total Eggs Collected.	Breakages.
	Old birds.	Chickens.	Collected.	Set.							
1											
2											
3											
4											
5											
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CHAPTER XVI

CONCLUSION

In the concluding chapter it is customary, I believe, to review broadly the contents of the preceding ones. I have tried to give as clearly as possible a true and faithful description of the plant and the way of working a large commercial poultry farm. It has been my desire throughout to give a true impression of everything, and to avoid being unduly optimistic or pessimistic about the future of commercial poultry farming.

If I have succeeded in impressing on the minds of those who are contemplating entering the industry that there is a good deal more in it than they may at first have thought, and that the preparation they must go through is more serious than they have hitherto considered would be necessary, I have not written in vain.

I am myself optimistic as to the future, but it would be foolish to ignore that, when thousands of birds are permanently occupying the same area of land, there may be risks of which we at present may not even be aware.

The whole future of the industry appears to me to depend upon two factors: the prevention of disease and the maintenance of fecundity. There is more obscurity about the first than the second. I have gone very fully, purposely, into the methods practised on this farm, with the hope that they are a means of effecting

PLATE XIV.

OLD RUNNER DUCKS.

To face p. 133.

the first, and I have also indicated what my views are for maintaining the second fundamental necessity. That commercial poultry farming is a paying proposition, *per se*, has been proved beyond all doubt. If any particular unit in the industry does not pay, its failure may be attributed to either faulty management or to its being inadequately capitalized. The majority of the older established industries pay, and are a success. There is always a minority that fails—poultry farming will be no exception.

Before concluding I should like to refer to a phase of poultry culture which, if not properly the subject of this book, is one that is closely allied to it. I am thinking of commercial poultry on the farm. Circumstances would seem to indicate that we are again about to pass through a revolution in agricultural economy. The Government's agricultural policy has gone by the board. Farmers will have to work out their own salvation, and this will not be achieved by growing corn. This nation has two propositions before it: (1) To remain an industrial nation with a population of forty to fifty million people earning its living by its exports and importing food. (2) To become a self-supporting country with a population of about half the number mentioned above. Naturally, it will choose the first, and endeavour to fulfil its requirements—the first of which is cheap food. With the exception of a few very favoured districts, corn must largely go out of cultivation. A pastoral type of agriculture will probably take its place. We should, under a wise land system, which the present is far from being, become almost or quite self-supporting in meat and all dairy products. Among the latter rank eggs and poultry. Farmers have not yet recognized the importance that poultry should play in the economy of pastoral agriculture, but they are beginning to learn. On a farm that was two-thirds arable and one-third grass, I learnt, like the majority of farmers, that livestock was the backbone of my industry. This was so in times that were not so unpropitious to corn-growing as the future is likely to be. If I were a young man, and I was contemplating an agricultural career in this country, I can visualize the kind of farm I should like and the one I think I could succeed in. It would be given up entirely to livestock—cattle, sheep, pigs and poultry—nearly all grass land, a quite small proportion of arable being reserved for roots and corn, the latter being grown mainly for the straw.

On every 10 or 15 acres of pasture I would erect a modern laying house for poultry, and stock it so that the land should carry some 10 to 15 fowls to the acre. These in their turn, besides being the most profitable stock on the farm, would greatly increase the stock-carrying capacity of the pastures in the cheapest possible way. All stock are fond of grazing after a dressing of poultry manure. Poultry under these conditions, for a very great part of the year, would procure half their own living. To secure the success of the whole undertaking, there must be one vital essential—the poultry must be free to be out in the early mornings, when natural food is plentiful; to keep them in till the sun is up would greatly prejudice their chances and stultify the whole scheme. Poultry are largely creatures of habit; if they only received one feed of corn per day, and that in the late afternoon, at break of day the whole flock would be eagerly scouring the land around them in every direction. An observant poultryman would easily tell by the birds' manners and appearances what sort of corn ration to provide in the afternoon for the next twenty-four hours.

In winter the corn could be supplemented by dry mash, if necessary. Those who write and speak in public in general terms often advocate the development of farm poultry; some of those who do so should realize how absolutely futile it is to do so while foxes are preserved. This fact would be quite sufficient to deter me from developing a farm on the lines I have barely outlined. If I were young, with the tastes and aspirations for living and working as a livestock farmer, I would not develop a farm for such a purpose in any fox-ridden country, because the factor of the greatest importance, both directly and indirectly, viz. poultry culture, would be impracticable on economic lines. If I could not find a spot free of this repressive pest—for it is by its repression of poultry culture that the real harm is done by the fox—I would take myself and my capital to some other country, where vermin are not preserved in the interests of the amusement of the few, against the interests of the whole community. The vested interests that protect the fox are very powerful; even the Ministry of Agriculture itself runs with the fox and hunts with the hounds, for it talks about "a give-and-take policy" and there being room for both, viz. foxes and poultry. With all respect, there can be nothing of the kind: foxes and poultry are as incompatible as the wolf and the lamb.

Having relieved myself by this diatribe against my natural enemy, I will wind up with a few remarks on the future development of commercial poultry farming proper, in which, if reasonable care is practised, the risks of losses from foxes are modified, although at a considerable sacrifice.

I believe the industry will continue to develop, but probably not at so fast a rate as appeared likely at one time. The economic conditions we are now encountering, or beginning to encounter, will be probably the normal conditions for some time to come. A further fall in prices will no doubt eventuate, but it may be hoped and expected that future changes will be less steeply graduated. We shall, in short, approach the conditions that prevailed pre-war, both as regards the cost of production and the sale of produce. We have learnt a great deal since 1914, and I do not feel apprehensive at all of the future, while admitting we still have a good deal before us in the way of acquiring experience.

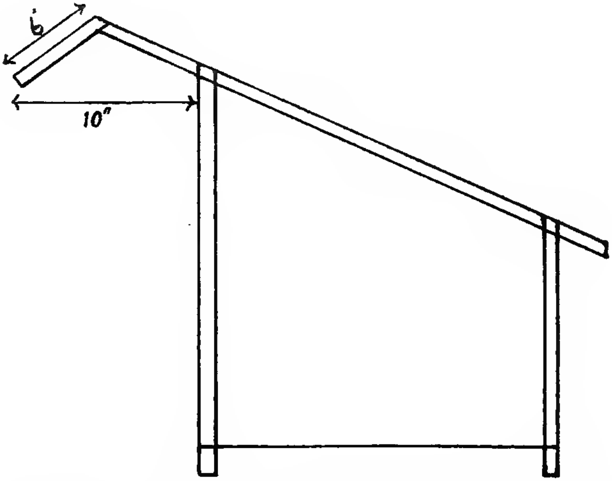
It is a versatile business, and can be carried on by men or women—in a small way, with a capital counted in hundreds, or in a large way, with many thousands at stake. It is full of details too numerous to enumerate, and is a business for individualistic management. If I had no other ties and land was available, I should be ambitious to run a farm for 10,000 head of laying stock in one farm—not in two, as I previously suggested.

It will be a satisfaction to think that the work which has been done. and which has been such a strong feature in the lives of some of us, may be of service to others and assist them to further develop and improve the methods of an industry which has now become an important branch of English agriculture.

Finality is not yet. This book has necessarily taken me several months to write. In this concluding chapter I feel I should state two changes that have taken place since the earlier pages were in print.

The breeding pens have been reduced in size by dividing three of the large houses into two complete sections each, and each section is equipped with two outside enclosures to be used alternately. I have placed a breeding flock of 75 hens and early pullets in each section with five cocks. They are as follows: White Wyandottes, Rhode Island Reds, Light Sussex and White Leghorns. This means that fewer pure breeds need be kept for stocking the first cross pens, and the numbers of pedigree cocks required are much less. In one of the other two section houses I have placed 75 Rhode Island Red hens, mated to five White Leghorn cocks, and in the other 75 White Wyandotte and Light Sussex hens in about equal numbers, mated to five White Leghorn cocks. I have retained the Houdan-Leghorns and the White Wyandotte-Rhode Island Reds in two full-sized flocks in two houses. So there are five houses now only retained for breeding, and one has been released for laying flocks. This makes a more compact arrangement, and with the smaller flocks a more careful selection can be made. The second important change is perhaps somewhat startling. I cannot claim that it is in more than the experimental stage, and I must admit I am going back on some things I have said previously. Still, if it answers, and so far the arrangement is working very well, it will be an immense boon, and a very great saving in expense and labour. I have placed the balance of the laying hens, some 5,000 head after deducting the breeders, on free range and have removed all the fences. I required a considerable amount of wire netting to repair the boundary fences, which are very extensive, being over a mile and a quarter in length. I have used the netting for these, and am waiting to see the result. I am depending upon the salt and lime treatment, and an increase of basic slag up to 10 or 12 cwt. yearly per acre, for maintaining the pasture in a sweet and healthy condition. This is certainly a Colony Semi-Intensive System.

As regards the chapters on Hatching and Rearing, the plant is now entering on its fifth season. I have little to revise, but owing to some very driving rains and snow, and a more exposed situation, we have found it desirable to extend the projecting front eave by attaching a hood to it in the shape of a weather-board 6 in. wide. I should like to say a word or two further about that vexed question, the size of flocks. I have found lately a growing feeling among experienced poultrymen that flocks have been too large, and that very probably, taking everything into consideration, 100 birds will be the best number to keep in one unit. My young friend has not built his houses yet, and I am much inclined to advise him to build them half the



SKETCH OF SIDE OF COOP, WHICH SHOWS THE NEW ATTACHMENT FORMING THE HOOD.

This is a valuable addition, as it is most important to keep the interior of the coop dry.

length mentioned, viz. 30 ft. × 14 ft. instead of 60 ft. × 14 ft. I think, too, I have rather overdone it in recommending that 300 birds be kept to the acre, and would prefer to advise that the number be restricted to 250. I have not long raised my own units from 150 to 170, and I see no advantage has accrued, but rather the reverse. I propose to reduce them again to 150 to 160. Egg production is an extremely delicate operation.

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